THE MOTHS OF THE BRITISH ISLES

WITH DESCRIPTIVE TEXT
BY
RICHARD SOUTH, F.E.S.

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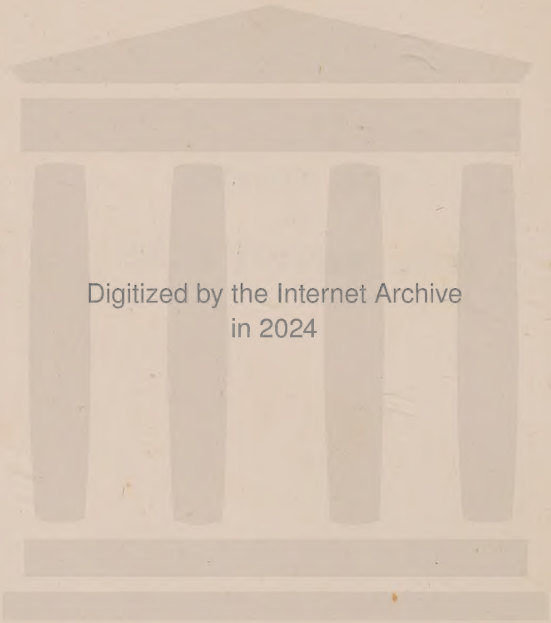

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Pl. 1. [*Frontispiece.*

1. **Spurge Hawk** ; *caterpillar.*
2, 3. **Silver-striped Hawk** ; *caterpillar.*
4. **Oleander Hawk** ; *caterpillar.*

THE MOTHS

OF THE

BRITISH ISLES

BY

RICHARD SOUTH, F.R.E.S.

AUTHOR OF
"THE BUTTERFLIES OF THE BRITISH ISLES"
EDITOR OF "THE ENTOMOLOGIST," ETC.

EDITED AND REVISED BY
H. M. EDELSTEN, F.R.E.S.

FIRST SERIES
COMPRISING
THE FAMILIES SPHINGIDÆ TO AGROTIDÆ

WITH
ACCURATELY COLOURED FIGURES
OF EVERY SPECIES AND MANY VARIETIES
ALSO DRAWINGS OF EGGS, CATERPILLARS
CHRYSALIDES AND FOOD-PLANTS

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PREFACE.

COMPARED with our butterflies, the number of moths found in the British Isles is very large. Like the butterflies, moths too are dependent upon plant life, and almost every kind of herb, bush, or tree, will be found to nourish the caterpillars of one or more species of moth.

Not only the field botanist, but every rambler in the country must constantly come across moths or caterpillars that will probably interest him, and of which he would be glad to learn something about their habits, life-history, and the position they occupy in the arrangement and classification of Natural History objects.

In the preparation of this little book on our moths, the author has proceeded closely on the lines adopted when dealing with the butterflies in his previous volume. That is, the chief aim has been to place before the nature lovers as much information concerning these creatures as could be condensed into moderate limits.

Lengthy descriptions were out of the question, but what might be considered an omission in this way, is amply compensated for by the life-like portraits of typical examples of the moths themselves, and in many cases of their more important varieties. Technicalities have been avoided as far as possible, the main object being to provide a guide to the identification of our moths, together with a simple account of the whole or a part of their earlier stages.

The author is fully aware that this method of treatment only enables him to touch the fringe of the subject, as it were, but he has been content to deal with it in this way, as it appeared to be the kind of information that would most nearly meet the requirements of the majority.

The author desires here to express his thanks to Mr. Robert Adkin, F.R.E.S., for the loan of specimens of *L. cænosa*, *E. ilicifolia*, *D. harpagula*, *N. albula*, *C. ærugula*, *H. barrettii*, *H. cæsia*, *A. xanthomista*, *A. extrema*, *L. favicolor*, *L. vitellina*, and *H. palustris*. To Mr. Alfred Sich, F.R.E.S., for the use of drawings of the caterpillars of *M. tiliæ*, *S. fagi*, *L. bicoloria*, *P. ridens*, *A. auricoma*, *A. rumicis*, *A. aceris*, *D. brunnea*, *D. oleracea*, *A. tragopoginis*, *O. gothica*, *and O. incerta*. To Mr. H. L. Sich for the loan of drawings of the caterpillars of *C. euphorbiæ*, *C. galii*, *D. ruficornis*, and *P. tremula*. For the material figured on Plate 148, except the larva of *L. putrescens*, kindly sent by Mr. Walker, of Torquay, he is indebted to Mr. H. M. Edelsten, F.R.E.S.

Except where otherwise mentioned, the illustrations of moths and caterpillars at rest are from photographs by " A Forester."

To Mr. Horace Knight he is very greatly obliged for the care bestowed upon the drawings of ova, larvæ, and pupæ, the bulk of which were made from living examples ; also the coloured drawings for Plates 1, 45, 63, 68, 73, 75, 80, 84, 90, 108, 119, 123, 140, 146, 149, and 153. The only figures copied from any previous publication are those of the caterpillars of *P. fuliginosa*, *D. sannio*, *U. pulchella*, *A. corticea*, *L. porphyrea*, *O. plecta*, and *G. augur* (Wilson's " Larvæ Brit. Lep.") ; and among the moths, the varieties of *A. caja ; C. mendica* (4 Yorks.), Trans. R. Ent. Soc Lond., 1889 ; *S. walkerii*, Curtis, and *C. subrosea*, Stephens.

RICHARD SOUTH.

PREFACE TO THE PRESENT EDITION

A NEW edition of this volume having become necessary it was deemed a fitting opportunity to bring the subject matter more into line with our present knowledge of the structure, habits, distribution, and nomenclature of the species considered therein. This has been established in collaboration with the lepidopterists in the Department of Entomology of the British Museum (Natural History). With this end in view, the new facts have been incorporated in the text as far as possible. Matter that could not be accommodated in this way has been presented in the form of an appendix.

I am very much indebted to Mr. W. H. T. Tams, F.R.E.S., for his great assistance with the nomenclature and his kind advice on the many problems which arose in the revision of this volume.

The Irish records have been brought up to date as far as possible from *The Catalogue of the Macro-Lepidoptera of Ireland,* published by Lt.-Col. Donovan, I.M.S. (retired).

A new General Index and also a Specific Index have been provided.

H. M. EDELSTEN.

THE MOTHS OF THE BRITISH ISLES.

PART I.

INTRODUCTORY.

As mentioned in "Butterflies of the British Isles," there is, speaking generally, no clear line of division between moths and butterflies, and, as Dr. Sharp, in "Insects," puts the case, "the only definition that can be given of Heterocera [moths] is the practical one that all Lepidoptera that are not butterflies are Heterocera." Now, it happens that all the butterflies occurring in these islands have the tips of the feelers (*antennæ*) clubbed; and, although there is much variety in the structure of these organs of our moths, none of them have the tips knobbed.

Like the butterflies, moths pass through the stages of egg, caterpillar, and chrysalis before they attain the perfect state (*imago*), and the duration of the several stages is just as variable. The majority assume the moth condition but once in the year, but some species have two, or even three, generations in the twelve months, whilst others occupy twenty-four months in completing the life cycle. In one or two species the chrysalis stage may last four, five, or even six years.

Diversity of form and structure is considerable in the early stages as well as in the perfect insects, and this is shown in the

selection of life-history details figured on the black and white plates in this volume.

Except that it is generally less prominent, the head, with the various parts thereof, is pretty much the same as in the butterflies. In a few families, however, the "tongue" (proboscis) is only rudimentary or even entirely absent; while in others it is

FIG. 1.

Convolvulus Hawk-moth and flower of Nicotiana.
(Photos by W. J. Lucas.)

very long. The Convolvulus Hawk-moth has the proboscis of such length that it is able to reach the deep-seated nectary of such tubular flowers as those of *Nicotiana affinis*. In the illustration the "tongue" of the moth and the sweet-scented tobacco blossom are shown on exactly the same scale.

Fig. 2 represents some forms of antennæ found in moths. A,

thickened and spreading out towards the tip (*dilate*); B, simple, thread-like (*filiform*) structure, without teeth, hairs, or bristles; C, fringed with fine hairs (*ciliate*); D, fringed with fine hairs, and with longer bristles at the joints (*setose ciliate*); E, the fringe in tufts (*fasciculate*); F, toothed, with fine hairs on the teeth (*dentate ciliate*); G, toothed with hairs in tufts from the teeth (*dentate fasciculate*); H, I, with double rows of hair

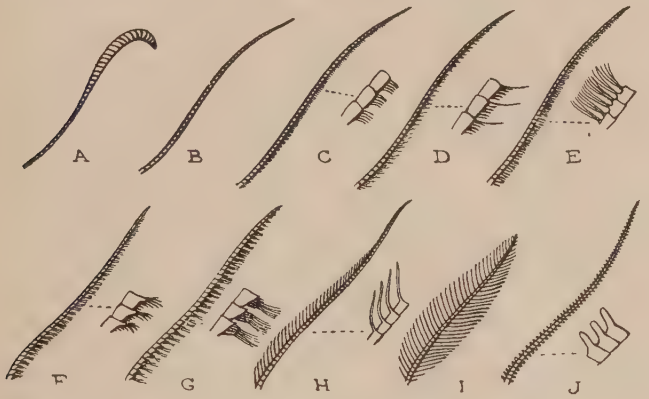


FIG. 2.
Antennæ of Moths.

scales (*bipectinate*); in I the projections are continued to the tip, and are themselves fringed with fine hairs, giving the antennæ a very feather-like appearance—the term "plumose" is sometimes used to describe this form of antennæ; in H the pectinations do not reach the apical fourth, which is simple. J, the *lamellate*, that is, the undersides of the rings or joints are made up of minute plates.

The wings of a moth are practically identical with those of a butterfly (see diagram "Butterflies of the British Isles," p. 12). Normally the fore wings have twelve ribs or veins, and the hind

wings eight, but in some genera a rib, or perhaps two, may be absent from the fore or the hind wings; or an extra rib, sometimes two, may be found on the hind wings. These modifications, and others, of the general plan of neuration have been employed as a basis upon which to found genera, or to group them together in classification.

FIG. 3.

Connecting Bristle and Catch.

Fig. 3 shows the arrangement by which the upper and lower wings of a moth are united in flight. The bristle (*frenulum*) arising from the base of the hind wing is held in place by the catch (*retinaculum*) on the costal nervure of the fore wing. It will be noticed that the bristle of the male is longer and firmer than that of the female. The latter, moreover, is usually made up of two or more strands; the catch, too, in the female is on the median instead of the costal nervure. These structures are found on the under side of the wings of most moths, but they are absent in all butterflies. The Emperor, Kentish Glory, and Eggars may be mentioned as examples of moths lacking the connecting bristle, but all these have feather-like antennæ, which terminate in a point. The Burnets have the antennæ gradually thickened towards the tip (A. Fig. 2), and in this respect are somewhat butterfly-like, but these moths have a *frenulum*.

FIG. 4.

The Jugum, or Yoke.

The hind wings of the Swifts, and a few others grouped with them, have twelve veins, and these moths have a *jugum*, or yoke (see Fig. 4). This is a flap-like projection from the inner margin, near the base, of the fore wing; it may serve to connect the wings when the insect flies, but it does not seem to be capable of giving much help in that way.

In describing a moth various markings, etc., have to be referred to, and as it may assist the reader more easily to locate the usual position of such characters the accompanying diagram has been prepared. The lines crossing the fore wings from the front edge, or margin (*costa*), to the inner edge, or margin (*dorsum*), are generally styled transverse lines ; the short one is the basal ; the first long one is the inner, or antemedial ; the second is the outer, or postmedial ; and the third is the

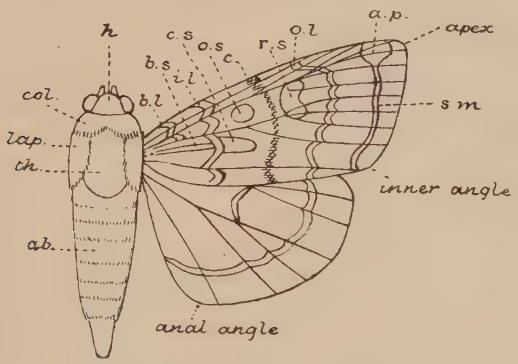


FIG. 5.

Wings and Body of a Moth.

h. Head ; *th.* Thorax ; *col.* Collar ; *lap.* Lappet ; *ab.* Abdomen. *b.l.* basal line ; *b.s.* basal streak ; *i.l.* inner line ; *c.s.* claviform stigma ; *o.s.* orbicular stigma ; *c.* central shade ; *r.s.* reniform stigma ; *o.l.* outer line ; *a.p.* apical patch ; *s.m.* submarginal line.

submarginal, or subterminal. The whole wing, less the margins, is sometimes called the disc ; but it is more convenient to divide the fore wing into three parts, naming that between the base of the wing and the first line the basal area ; the space between the first and second lines the central or median area, and the part beyond the second line the outer area. The more or less round or oval rings or dashes on

the central area are the stigmata, and these characters occur more especially in the Agrotidæ. The hind wings usually have a fine short line, crescent, or spot, at the end of the cell, as in the butterflies, and there is generally a line or band beyond.

Immediately behind the head and covering the front part of the thorax is a tippet-like arrangement of scales; this is the collar. On each side of the thorax there is a shoulder lappet (*patagium*) which has its base on the front part of the thorax also. Both tippet and lappet are often peculiarly ornamented, and the former is sometimes strikingly coloured. The thorax is sometimes crested, and more frequently the body is furnished with raised tufts of hair scales.

The number of moths occurring in the British Islands is well over two thousand. The majority of these hardly ever find favour with the collector. This is probably owing in a large measure to the fact that they belong to a division of the moth tribe which has been dubbed Micro-lepidoptera. It happens, however, that quite a number of the species included in that division are actually larger than many kinds that were placed in the other contingent styled Macro-lepidoptera. According to the most recent authorities the division of moths into two such main groups as those adverted to is entirely fictitious and misleading. Possibly, when this new order of things is more generally understood the so-called "Micros" will receive their proper share of attention.

In the older systems of classification the Clear wings (Sesiidæ) were associated with the Hawk-moths (Sphingidæ). Meyrick considered the former family to be more closely connected with the Tineidæ. He removed the Goat-moth (*Cossus cossus*) from among the Bombyces, changed its name to *Trypanus cossus*, and placed it in the family Trypanidæ, which he relegated to the neighbourhood of the Tortricidæ. The Burnets (Zygænidæ), together with *Heterogenea asella*, *Apoda limacodes*, *Phragmatœcia castaneæ* and *Zeuzera pyrina* (Cossidæ part), were re-

moved by Meyrick to the Psychina, a group placed between that author's Pyralidina and Tortricina. The Swifts (Hepialidæ) were grouped with Micropterygidæ, which were considered to be primitive forms of Lepidoptera originating in the Caddis-flies or Trichoptera—a division of the Order Neuroptera.

Except that the Arctiidæ are placed immediately before the Agrotidæ instead of after the Geometridæ, the arrangement of families, genera, and species adopted in the present work is very much the same as that in the 1901 edition of Staudinger's Catalogue. Many British entomologists are now interested in the lepidopterous insects of the Palæarctic, or at least the European, fauna, of which our islands furnish but a relatively small number of species. Others, who at the present time are perhaps but beginners, may very possibly desire, later on, to extend their collections and their knowledge by making entomological expeditions to various parts of the continent. It seemed therefore desirable that in an introductory book on British moths its method of arrangement should at least be founded on some generally accepted system.

FIG. 6.

Pale Tussock-moth at rest.

Field Work.

Several methods of moth collecting are in vogue, but space will only permit of a few of those most frequently practised being here referred to, and those suitable for day work will first be considered. Although small woods should not be neglected, large tracts of woodland afford the moth hunter the best chance of success in searching for those species that usually sit during the daytime on the trunks of trees. Many of the moths that rest in this way so admirably blend with their surroundings that they may easily be overlooked; others by their resemblance to feathers, birds' excrement, etc., are also apt to escape detection. Tree trunks, too, abound in moth-like scars, blotches, and knobs, so that the beginner will frequently fail to readily distinguish a moth from such objects, or from the others mentioned. A little practice will soon enable him to tell

Fig. 7.
Drinker-moth at rest.

which is which without having to very closely investigate, or perhaps even touch the suspected object.

As a general rule it is no doubt best to confine ourselves to one thing at a time, if the results are to be satisfactory and the work well done. In the present case, if he feels that way, the collector can relieve the monotony of trunk searching by operating in another direction at the same time. Some moths prefer to repose on the branches, or on the leaves of trees, others among the herbage under trees; these may be disturbed from their lurking places and caused to fall or take wing by jarring the boughs or brushing the undergrowth with a stick.

FIG. 8.
Scarce Merveille du Jour at rest.

Palings, especially old ones and those enclosing wooded parks, etc., are often frequented by numbers of moths. These should be examined as early as possible in the morning, although

a later looking over may not be unprofitable. When, however, the wind is dead on them, or where they stand exposed to full sunshine, few insects will be found upon them. Various species are to be obtained from open post and rail fences, and even iron hurdles sometimes yield a good moth or two. Walls are not to be despised, and of course rocks on the moorlands, and the cliffs by the sea afford suitable resting-places for many kinds of moth. As a matter of fact the eyes of the entomologist should always be peering about, as a valuable prize may turn up in the most unexpected places. Hedgerows and bushes in lanes, or bordering fields and woods, afford shelter to many species of moths, and some kinds, not necessarily the commonest, may now and then be beaten from them freely. Herbage on hill or down sides, and on the moor and moorlands is also a favourite hiding-place, as too is the marram grass, etc., on the coast sandhills.

FIG. 9.
Broad-bordered Yellow Underwing at sugar.

As the day draws to a close and the night advances, the moths awaken, and first one kind and then another rises on the wing. These, as they fly in the lanes, about the borders or along the rides of woods, and over the vegetation in meadow,

fen, or moor, should furnish ample employment and keep the collector actively engaged until the time arrives for a first round of the trees upon which he has spread a dainty repast for the night-flying Agrotidæ, and those members of the Arctiidæ and Geometridæ, etc., that frequently look in where sweets are to be obtained.

FIG. 10.
Purple Clay Moth at rest.

This sugaring business is perhaps the most exciting phase of collecting. Having prepared a fine compound of coarse brown or "foots" sugar, treacle, and beer, by boiling down these ingredients to a suitable liquid condition, this is taken to the scene of action in a sugaring tin, a receptacle fitted with a brush which is fixed in the screw-on top; or the attracting medium may be carried in any kind of convenient bottle providing a paintbrush (sash tool) and a jampot or some such article accompany it. Arrived on the ground, preferably a wood, a ride is selected along each side of which are convenient trees.

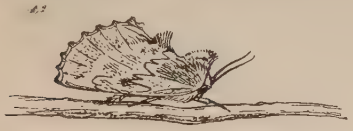


FIG. 11.
The Coxcomb at rest.

A glade such as that in the New Forest, photographed by Mr. W. J. Lucas, and reproduced in Fig. 12, is an ideal pitch. Just before using, a very small quantity of rum may be added to the mixture, but if "foots" can be obtained the rum is not required. In the autumn I have found a drop or two of the essence of

jargonelle pear, or of ribstone pippin, an effective addition. Now comes the initial stage in the night's venture, the "sugar" is put on each tree in a streak extending downwards about a foot from the level of one's chin; if thin enough to spread easily the mixture is almost certain to run further down the trunk. Whilst

FIG. 12.
A Ride in the New Forest.

employed in this somewhat messy preliminary we meditate on the possible result, and hope that if visitors are not numerous they may at least be select. Lighting the lantern, the first round of inspection of the sugar patches is made, but this may not be altogether encouraging; on only one tree are there any moths and these but three in number, and not uncommon kinds (see Fig. 13). The second and even the third rounds do not

give the satisfactory results we had anticipated, and we feel inclined to retire discomfited ; but as a sort of forlorn hope we try once again, and this time we secure one or two really good things. Another night moths arrive quite early and in large numbers, chiefly commoners, but with a sprinkling of the better

FIG. 13.
Moths at a Sugar patch.

sorts among them. Just what meteorological or other conditions are most conducive to a successful sugaring expedition I have never been able to ascertain. Often blanks have been drawn when the weather has seemingly been the most favourable, and quite as frequently good bags have been made when exactly the reverse was thought to be more likely. If the natural attractions

in the way of flowers and "honey dew" abound, the insects may possibly ignore the most tempting bait we can contrive for them. There is much uncertainty in this favourite method of collecting, and whether sugar is put on tree trunks, foliage, palings, rocks, or stones, or smeared on rags, and these hung up on barbed wire fences; or daubed on heads of thistles or bunches of grass heads tied together, one must be prepared to accept the disappointments that are inevitable, however careful we may be in the selection of "suitable evenings." It may be added that newly sugared trees are generally less attractive than those that are frequently painted with the mixture.

FIG. 14.
Caterpillar of Eyed Hawk-moth.

Caterpillars that feed on the foliage of trees and shrubs may

be obtained by beating. The collector with one hand holds an open and inverted umbrella, or a Bignall tray made expressly for the purpose, under a branch, whilst with the other hand, armed with a stick, he strikes the branches from above in the direction of the receiver held below. In conducting such operations some collectors are far too energetic. It should be remembered that it is not hard thrashing, but a sudden jar that dislodges the caterpillars most readily.

FIG. 15.
Caterpillar of Privet Hawk-moth.

Although oft-times a somewhat slow process, and to some temperaments, perhaps, rather tedious work, searching for larvæ is not unremunerative when the quality of the material obtained in this way is considered. Some kinds sit in the daytime, or feed, fully exposed, upon the upper sides of the leaves or on the twigs of trees, shrubs, and low herbage; these are not difficult to see. Other kinds conceal themselves under the leaves or on the twigs hidden by the foliage, and these have to be sought for, because many of them cling so tightly to whatever they may be upon that hardly anything short of a fatal blow with the beating-stick will cause them to relax their hold. Others, again, spin two or more leaves together, and in the

habitation thus formed they remain throughout the day. The latter are more easy to see than the more readily evicted contingent. All we have to do is to stand under the branches and look upwards and outwards, when the united leaves and the form of the caterpillar between them will be detected. Some, of course, will be high up and out of reach in the ordinary way, but there will be others more accessible. Then, at night, especially in the early spring, we may search, aided by the beam of an acetylene lamp, the plants and undergrowth in wood rides and clearings, borders of woods, and lanes, for caterpillars that are rousing from hibernation. Throughout all searching operations for larvæ the chance finding of eggs under leaves or on twigs or buds is always probable. Cocoons in addition, among the leaves of trees and on stems of low plants and the trunks of trees, may also be revealed.

FIG. 16.
Caterpillar of Pale Tussock-moth.

Furnished with a trowel — the ordinary garden kind will do, but the flatter pattern, sold by dealers, is better—the collector may take a turn at digging at the roots of trees for chrysalides. No doubt there are many kinds to be obtained in this way, but I cannot say much for the practice, as my own efforts have not been very highly rewarded. Not a single species was ever obtained by digging that I could not have secured more easily in some other way.

Methods of setting, and after-manipulation have been fully discussed in "Butterflies of the British Isles."

PART II.

DESCRIPTIONS OF SPECIES.

HAWK-MOTHS.

ABOUT sixty species belonging to this family, scientifically known as the Sphingidæ, are recorded from the Palæarctic region, and of these twenty-seven are found in Europe. About ten only can be considered as true natives of the British Isles ; seven others, though found here, are distinctly aliens, and their visits, at least as regards some of them, to our islands, exceedingly irregular.

Most of the moths are of large size, many of the caterpillars are of noble proportions, and in both stages they are not difficult to find, if looked for in suitable places and in their proper season. The caterpillars of several kinds, owing to the exposed way in which they feed or rest, are especially noticeable on bush and hedgerow ; the chrysalides, although subterranean, are often freely obtained by turning up the soil around trunks of trees, or under plants, upon which the caterpillars feed.

The Lime Hawk-moth (*Mimas tiliæ*).

The four specimens shown on Plate 3 represent the more or less ordinary form of this moth. The pale pinkish grey, or reddish brown, fore wings are sometimes tinged with greenish in the paler forms; the irregular shaped band crossing the

central area of the wings is olive green, usually dark, and generally edged with whitish. This band is sometimes entire (typical), but more frequently it is broken about the middle. The outer third of these wings is more or less greenish or mottled with green, and a mark near the tip is whitish.

Variation is chiefly connected with the modifications that occur in the upper or lower, sometimes both, portions of the central band ; the lower seems to be the first to disappear, then the upper passes through various stages of reduction until it becomes simply a spot or dot about the centre of the wing. Specimens are occasionally found or reared, in which every trace of the band has departed from one or both fore wings. The greenish outer border of the wings is inwardly margined with darker, well defined and band-like in some examples, but less clearly marked, or even absent, in others. Near the base of the fore wings are often two dusky greenish cross lines. The hind wings, generally pretty much of the same ground colour as the fore wings, have a dusky band-like shade of variable width on the outer third ; sometimes these wings are entirely dusky, approaching blackish. Very rarely specimens are bred in which there is no trace of green colour. Such an example was reared by Mr. Frohawk in April, 1882, from a caterpillar he found in Surrey. In this aberration all the markings (normally green) are light burnt-sienna red, the usual whitish blotch at the tip of the fore wings is pink ; ground colour also pink, slightly tinged with grey in places. So variable is this moth in colour and markings, that in some collections at least one cabinet drawer is given to it so that the range of aberration may be adequately shown. Already about eighteen colour modifications have been named, and at least eight band variations have also received names.

The egg is similar in general appearance to that of the next species (see Plate 4). Dr. Chapman states that it is more densely covered with an indiarubber-like gum, and this may cause it to

Pl. 2. *C* 18.

Lime Hawk-moth.
Caterpillar and chrysalis.

Pl. 3.

Lime Hawk-moth.

C 19.

seem darker than the eggs of the Eyed and the Poplar Hawk-moths. The eggs are laid singly or in pairs on the underside of elm or lime leaves.

The figure of a nearly full-grown caterpillar (Plate 2) is from a drawing in colour by Mr. A. Sich. Shortly, the caterpillar may be described as green, roughened with yellow points, and with seven yellow oblique stripes on the sides, each edged above with purplish and reddish ; the spiracles are ringed with reddish, and the curved horn is blue, inclining to yellowish beneath and at the tip ; the roughened shield on the last ring of the body is reddish, marked with yellow. Head triangular, smoother than the body. Quite in its infancy, the caterpillar is a long, thin creature ; the horn, which is divided at the tip, is covered with short, stiff hairs, and appears blackish ; later on the horn becomes reddish, and the side stripes appear on the body. Although alder, birch, and several other shrubs and trees have been mentioned, there is no doubt that the foliage of elm and lime is the chief food of the caterpillar in a state of nature. Found in July and August.

The chrysalis is dark reddish, and somewhat rough. As a rule, it is enclosed in a very fragile cell which the caterpillar makes for itself after burrowing a few inches underground and near the trunk of an elm or a lime tree. There are, however, records of the chrysalis having been found in crevices of bark high up on elm trees.

In May and June the moth emerges, usually in the afternoon, and may sometimes be found on the trunks of trees, or on palings near limes and elms. When at rest the fore wings are so arranged over the hind ones that they, in conjunction with the upturned body, give the insect more the appearance of a bunch of immature leaves than of a moth.

The species is widely distributed throughout the southern counties of England, and in some of them, more especially around London, it is common. In the Midlands it seems to be

scarce, and apparently does not occur farther north than Yorkshire, from which county there is only a single record. It is common in Europe, except in the more northern and southern parts, and its range extends eastwards into Siberia.

The Poplar Hawk-moth (*Laothoe populi*).

On Plate 5 are three slightly different examples of this moth. In colour it is most frequently ashy grey, with a brownish central band, and other markings ; there is a white spot on the fore wings and a conspicuous red patch at the base of the hind wings. The female is generally paler than the male, and often has a pinkish tinge. Specimens of a pale buff colour are sometimes obtained, and these are most often of the female sex, although male examples of this form are not unknown. Among unusual aberrations is one described as having the wings, legs, thorax, and abdomen of a colour between brick-red and chocolate, suffused with a whitish bloom as on ripe plums. Another had the hind wings unadorned with red. Specimens from Aberdeenshire and Sutherlandshire are smaller than English examples, and the males are almost always more brightly and distinctly marked.

A very large number of gynandromorphous specimens have been recorded, several of them from Britain ; in most of these the gynandromorphism is bilateral, that is the insect is wholly male on one side, and entirely female on the other. In some the right side is male, in others the left side ; the opposite side in each case being female. Much information on this subject and on Hybridism of the Sphingidæ will be found in Tutt's " British Lepidoptera," vol. iii.

The pale shining green eggs are laid, generally singly, but sometimes in twos, threes, or more, on either surface of a leaf of poplar or sallow. Now and then batches of eggs may be found, and these have probably been laid by females that were crippled

Pl. 4. *C* 20.

Poplar Hawk-moth.

Eggs, natural size and enlarged; caterpillar and chrysalis.

Pl. 5

Poplar Hawk-moth.

C 21

on emergence, or had been afterwards injured in some way and so were unable to fly.

When full grown the caterpillar is green, roughened with yellow points, oblique stripes on the sides yellow, spiracles reddish, horn of the general colour, sometimes tipped with reddish. Head triangular in shape, but not pointed on the top. A reddish spotted form of the caterpillar is not very uncommon. In its very early life the head is rather triangular than rounded, as is the head of the young caterpillar of the previous species, and also that of the Eyed Hawk. Feeds on poplar, aspen, sallow, and willow, and may be found from July to September and sometimes October. Chrysalis blackish, rougher than that of the Lime Hawk. It lies in the ground so close to the surface that it is often exposed when the garden borders under or near poplars are raked over. The moth appears in May and June as a rule, but in backward seasons it may not emerge until July or even August. Caterpillars from eggs laid in early May are likely to feed up and attain the perfect state in late July, and eggs resulting from these will pass through the caterpillar state to that of chrysalis by about

FIG. 17.
Eggs of Poplar Hawk-moth.

September. Three broods have been obtained in one year, but this is exceptional and under a forcing method of treatment. The early stages are figured on Plate 4. This is certainly the commonest of our Hawk-moths, and it seems to occur throughout our islands, except that in Scotland it is not recorded further north than Sutherland and Ross. Wherever there are poplars, sallows, or willows, there too most probably will be this caterpillar in its season; the moth also will be almost certainly seen by any one who may care to keep an eye on the stems of poplars or adjacent fences at the right time. Sometimes the insect will introduce itself to the household, after lighting-up time, much to the alarm of those who, not aware of the harmless character of their visitor, look upon it with considerable suspicion.

Distribution abroad—Europe (except the polar regions and Greece), Armenia and the Altai.

The Eyed Hawk-moth (*Smerinthus ocellata*).

Except that there is sometimes an absence of rosy tinge on the fore wings, and that the brownish markings may be lighter or darker, this species does not depart very greatly from the typical form shown on Plate 7.

Cross pairings between the Eyed-hawk and the Poplar-hawk are not altogether difficult to obtain, but the female *populi* pairs more readily with male *ocellata* than the female of the last named species will with the male of *populi*. Very few such cross pairings have been noted in a wild state, but several cases of the kind are known to have occurred in captivity. The results are hybrid moths, and these have some of the characters of each parent, and have received distinctive names. Thus the offspring of *ocellata* ♂ × *populi* ♀ are the *hybridus*, Steph., whilst that of *populi* ♂ × *ocellata* ♀ are referable to *inversa*, Tutt.

Pl. 6. *C* 22.

Eyed Hawk-moth.

Eggs, natural size and enlarged; caterpillars and chrysalis.

Pl. 7.

Eyed Hawk-moth.

C 23.

The eggs, which are generally laid singly or in pairs on either side of a leaf, sometimes on a stalk, are yellowish-green in colour. The shell is said to be netted, but under a fairly strong lens this does not show. About four hundred is probably the average number for a female to lay in a state of nature, but they seem not to deposit so many when reared from the egg in confinement. As the moth, except under stress of circumstances, places her eggs on the foliage of trees and bushes in selected positions, the business of egg laying takes about six nights to perform. Even when she is unable to fly she will crawl from twig to twig and glue an egg here and there on the leaves, but rarely more than two on a leaf. On a small sallow bush in my garden, I once counted eighty-four eggs on the lower leaves and the main stem. Green, inclining to yellowish or greyish, is the colour of the full-grown caterpillar. It is roughened with white points, and has seven whitish oblique stripes on the sides. These stripes are edged in front with darkish green and occasionally tinged with violet. The horn is bluish, merging into green towards the dark tip, and roughened with white points. Head triangular in shape, the top pointed ; face tinged with bluish. Sometimes bright red spots appear on the sides in some examples of the caterpillar. In the quite young stage the head is usually rounded ; the horn, which appears reddish, is about one third the length of the caterpillar.

Sallow, willow, and apple are the more general food plants, but poplar and privet have been reported. I have sometimes found the larva on *Salix repens*, and also on crab-apple (*Pyrus malus*). It may be found in July and August. In some years, when the moths emerge in May, caterpillars are found as early as June, and this is followed by the occurrence of the caterpillar again, as a second brood, in August and September. When quite mature the caterpillar enters an inch or two into the soil, and there forms a weak sort of cell in which it shortly afterwards turns to a brown, or blackish-brown, smooth and

rather glossy chrysalis. The early stages are figured on Plate 6.

The moth usually emerges in June, earlier or later, according to season. Under very favourable circumstances some of the moths will leave the chrysalis in May and give rise to a second generation in July. An unfavourable year, on the other hand, retards emergence, and the moths do not come up until late June or mid-July ; such as was the case in 1907.

Generally distributed and by no means uncommon throughout the southern half of England, but somewhat local northwards. It has been recorded from the most southern counties of Scotland, and Kane states that in Ireland it is widely distributed but usually scarce.

The method of folding down its wings in repose is very similar to that of the previous two species.

The Death's-head Hawk Moth (*Acherontia atropos*).

The fine moth represented on Plate 8 is the largest species found in the British Isles, although in measurement from tip to tip when the wings are expanded it does not exceed that of the next species, both varying in this respect from $4\frac{1}{2}$ to 5 inches. It is, however, a stouter bodied insect, and its wings are broader. The colour and markings are so well shown in the illustration that a description is unnecessary. Beyond a greater or lesser intensity of the paler markings on the fore wings and the thorax, also some modifications in the black band of the hind wings, there is nothing very striking in the way of variation. Perhaps the most important aberrations are connected with the inner black band of the hind wings, which may be much widened and diffuse, or, on the other hand, entirely absent.

When full grown, the caterpillar attains a length of nearly 5 inches, and is of considerable thickness throughout. Usually

the general colour is some shade of green, varying to yellowish, but in some examples it is brown, more or less tinged with violet; others again are of a blackish hue. The seven oblique side stripes are purplish or violet brown, edged with yellowish; they are absent from the three rings nearest the head; the rough, double curved horn is of the body colour. The greenish forms are sprinkled with violet dots, and the brownish forms with white ones. Most frequently found on the leaves of potato; it feeds also on the "tea-tree" (*Lycium barbarum*), woody nightshade (*Solanum dulcamara*), and snowberry (*Symphoricarpus*). Fig. 1, Plate 9, represents the brown form of the caterpillar.

When ready to enter the chrysalis state, the caterpillar burrows from 2 to 4 inches below the surface of the soil, and there forms a large chamber, the walls of which are not very substantial and are easily broken. After resting therein for a week, or two, it turns to a dark brownish, rather glossy, chrysalis. (Plate 11, Fig. 1). The earthen cocoon, frail as it is, seems to be a protection to the chrysalis, guarding it from too much moisture on the one hand, or dryness on the other. I always found that when chrysalids from caterpillars that I have obtained were left undisturbed the moths emerged well enough; but when they were turned up out of the ground by the potato diggers, and, of course, without covering, they were almost certain to perish if the attempt were made to keep them through the winter. In the latter case, the only chance was to endeavour to induce the moth to emerge as soon as possible by bringing them under the combined influence of warmth and moisture.

This species was known to Mouffett, who figured it in 1634, but it does not appear to have received an English name until 1773, when Wilkes figured it as the "Jasmine Hawk Moth." Moses Harris, in 1775, called it the "Bee Tyger Hawk Moth," but three years later he changed the name to the Death's Head, the name by which it is still known, although in some

parts of England, as well as in Ireland, it is referred to as the "bee robber." In connection with the latter name, it may be mentioned that the moth's "tongue," or proboscis, is short, and not adapted for obtaining sweets, of which it is very fond, from long-tubed flowers, consequently it filches honey from the bees, and, with this object, has been known to enter bee-hives, at least those of the old straw-skep pattern. The moth is also said to have a liking for the sap exuded by wounded trees. Although the species may, perhaps, be with us in certain favoured localities every year, it does not often occur, in any stage, in numbers sufficient to attract general attention. I have not searched the chronicles of *Atropos* in Britain earlier than 1864, but from these it seems that the species was widely distributed and generally common in 1865, 1868, 1878, 1885, 1896, and 1900. More or less common in certain localities in 1867, 1869, 1870–1872, 1877, 1880, 1882, 1884, 1893, 1895, 1899, 1911, and 1917. In the other years it was scarce, or apparently absent.

The moth is always very much less in evidence than the caterpillar, or even the chrysalis. Sometimes the former is seen in May or June, or even earlier, and it has been supposed that these precocious specimens have hibernated after emergence from the chrysalis here during the previous autumn. The question of hibernation need not be entertained, but there may be doubt as to whether the specimens are British born or aliens. I am inclined to the latter view. The moths are often noted at sea long distances from land. A specimen was captured on board a vessel in the North Sea on April 28, 1903, and it was still alive, although it had been roughly dealt with, on May 8 of that year. In 1899 a moth was taken at Chester, about the middle of May, and one on June 20 at Chichester. Probably, although undetected, other specimens were also about the country, and maybe at even earlier dates than those recorded. However, during the year larvæ and pupæ were found, at the

Pl. 8. Death's-head Hawk-moth. *C* 26.

Pl. 9.

1. Death's-head Hawk-moth.
Eggs, natural size and enlarged; and caterpillar.
2. Convolvulus Hawk-moth Caterpillar (dark form).

C 27.

end of July, at Chilton, Suffolk, and at Bridgwater, Somerset, and in early August in Somerset, and at Dover. A moth was captured in August at Marlow, Bucks., one was taken at Christchurch on September 19, one at Reigate, September 25. Several specimens occurred in Devon and Cornwall in the autumn, and at Deal early in October. Larvæ were found, too, from the second week in September to the end of that month in several parts of the country. Moths seem to have been reared in early September from the early August caterpillars; whilst the September caterpillars attained the perfect state towards the end of the month and in October. Two pupæ, found at Penarth on September 12, produced moths in from four to six days afterwards; four other chrysalids, obtained in Hants about mid September, yielded moths between September 21 and the beginning of October.

From the foregoing there can be no question that there are at least two generations of the moth in some years, and in our own country, but we have even clearer evidence of this in the records of 1900, when a moth was taken in the spring at Ayton, Berwickshire, another at Worsborough Bridge on June 18, and a third at Kilmarnock, on a bee-hive, July 11. Caterpillars were found during late July and August in South Scotland and various parts of England, and moths were reared from some of these. In September and October caterpillars were found more commonly, and two or three moths were captured, in various places, between August 19 and October 9; others, reared from September caterpillars, emerged from October 30 to November 24.

By the rustic, and possibly the uninitiated generally, the moth is looked upon as something uncanny. This is probably due to the fact that the creature, when handled, emits a peculiar sound that has been described as a shrill squeak. According to Kirby, the statement made by Rossi that the sound is produced by air from the air-sacs being forced through the

proboscis, has been verified. Another dread-inspiring character of the insect is the marking on the thorax, which has been likened to a skull and crossbones. The squeak is said to have the effect of quieting the bees, they being under the impression that it proceeds from their queen.

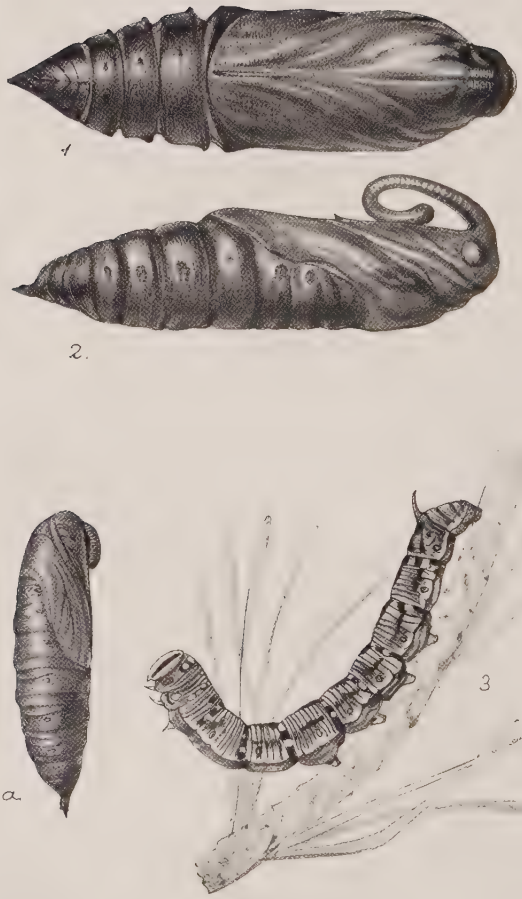
It has been taken at some time or another in almost every part of the British Isles, right up to and including the Shetlands. Except that it has not been observed in the more northern parts, the species is found throughout Europe, North and South Africa, the Canary Islands, and the Azores. It is also represented in Southern India, extending to the Malays, and in China, Corea, and Japan.

Convolvulus Hawk-moth (*Herse convolvuli*).

The older writers on British moths called this the "Unicorn" or "Bindweed Hawk." The fore wings are whitish grey, mottled with darker tints, and, in the male, clouded with blackish about the middle of the wing; the middle third is limited inwardly by a double blackish, wavy line, and outwardly by an irregular, toothed, whitish line; running from one to the other are two black streaks between the veins, and a similar streak nearer the costa is waved upwards to the tip of the wing. The hind wings are whitish grey, with a black stripe near the base, and two blackish bands between the stripe and the outer margin. The thorax agrees in colour with the fore wings; the tapered body has a broad grey stripe, enclosing a central black line along the back, broad red and black and narrow white bands on each side (Plate 10).

The egg has been described as bright green in colour, and smaller than that of the Privet Hawk. A female moth captured at Brighton on July 18, 1898, deposited twenty-five eggs on *Convolvulus arvensis* up to July 20, and the next day a further eight were counted. The moth died on the 22nd.

Pl. 10. Convolvulus Hawk-moth. *C* 28.



Pl. II.

1. Chrysalis of Death's-head Hawk-moth.
2. ,, ,, Convolvulus ,, ,,
3, 3*a*. Caterpillar and Chrysalis of Pine Hawk.

C 29.

Caterpillars hatched out July 27–28. These were whitish green, with a rough blackish horn ; after second moult they became green, with a darker green stripe along the back, but without oblique side stripes.

In its more usual form the caterpillar, when full grown, is bright apple-green, narrowly streaked with black ; oblique stripes on the sides yellowish ; horn reddish, tip black. Head green, with black stripes. In some examples the side stripes are edged above with bluish black ; in others there are blackish, more or less square, spots on the back, and patches on the sides. Sometimes the general colour is blackish brown, with ochreous bands and streaks. (This form is figured on Plate 9). When it occurs in these islands it is generally found on the small bindweed (*Convolvulus arvensis*), but it will eat *C. sepium* and *C. soldanella*, and also the cultivated kinds.

Referring to the caterpillar in Britain, Moses Harris, in 1775, wrote, " I never heard of but two that were ever found—one by Mr. South [or Smith] of Hampshire, which, he said, was green, and appeared in other respects so like the privet that he was deceived. He fed it on the leaves of the lesser bindweed. It changed into the chrysalis in the earth, in July, and the moth was produced in September " (Dale).

The caterpillar figured by Harris is of the brown form, so we see that even at this early date something was known of the life history of this moth and the variation of the caterpillar. Since that date and up to 1894 only very few larvæ appear to have been found in our islands. Barrett states that it is doubtful if more than twenty had then been recorded. In 1895 caterpillars were obtained in Cornwall (four) and in Kent (two). Then for five years little or nothing was reported about this stage, although the moth seems to have occurred in varying numbers each year. In 1901, August and September, over one hundred were reported, rather more than half of which were taken from a hedgerow, overgrown with *C. sepium*, in

Northumberland ; twenty-six were obtained on the bindweed growing on Lancashire sandhills, thirteen or fourteen in Essex, and others in Bedfordshire, Kent, Hants, Dorset, and Devon.

Mr. Bell-Marley obtained thirty eggs, September, 1897, and although these were kept in a cold room, thirteen caterpillars hatched, September 21. They were supplied with *Convolvulus arvensis* and *C. soldanella*, and seemed to relish one as much as the other. Seven died during the first three moults. The bindweeds being nearly over, seedlings were raised by forcing, but before these were ready the larvæ had been on short commons, and just immediately before the seedlings came to hand, had been twenty-four hours without food. On these tender seedlings and some endive the remaining larvæ, six in number, attained full growth in December. Two subsequently died in the first half of that month, and the others went under the soil. Only one, however, managed to assume the chrysalis state.

A small caterpillar, about one week old, described by Paymaster-in-Chief G. F. Mathew ("Notes on Lepidoptera from the Mediterranean," *Entom.*, xxxi. 115), was $1\frac{3}{4}$ inch long, pale glaucous green in colour, and thickly covered with raised white dots ; oblique side stripes white, bordered above with dark green. On September 26, 1897, this caterpillar, which had been found on September 18, was nearly full grown, and the writer goes on to state that when gathering bindweed he obtained either eggs or tiny caterpillars at the same time, and he eventually found that he had eight of them altogether. They fed up rapidly, as a caterpillar, hatched about September 27, had gone down on October 18. Owing to accident, four produced deformed chrysalids, but each chrysalis resulting from the others was perfect and healthy on February 15, 1898. The large reddish-brown chrysalis is figured on Plate 11, and it will be noted that the "tongue" case forms a curious bent projection not unlike the handle of a pitcher. To give some idea of

Pl. 12.

1. **Privet Hawk-moth.**
2. **Pine Hawk-moth.**

C 30.

Pl. 13. C 31.

Privet Hawk-moth.

Eggs, natural size and enlarged; caterpillars and chrysalis.

the irregular way in which this migratory species visits our islands, it will suffice to note the records only since 1894. Previous to that year it was common, more or less generally, in 1846, 1868, 1875, 1885, and 1887.

In 1895 an invasion seems to have effected a landing in the autumn, on the south-west coast, chiefly, perhaps, in the Portland district, where some fifty individuals were captured between August 12 and October 7 ; twenty-three were caught near Bournemouth in August and September ; sixteen were taken at Christchurch, August 11 to October 2 ; and eight were recorded from Milford. Several were reported from Devon, but only two from Cornwall, although four larvæ were found in October at Port Wrinkle in the latter county. At Cork, in Ireland, ten specimens were obtained in October. Eastward, the captures in September were Norfolk (seven), Essex (one), Lincoln (one). Odd specimens were taken here and there in Kent, Surrey, and Herts. Several were reported from Gloucestershire, and one from South Wales. The northward extension was evidenced by the capture of one example at Alnwick, in Northumberland, in September, and of two in Aberdeenshire, one as early as August 31, the other September 9.

The moth was almost a defaulter in 1896, but in 1897 about forty specimens were taken, twenty-seven of which occurred in the Scilly Isles and eleven at Portland (August 14 to September 16. One example was reported from Yorkshire and another from Sutherlandshire, both in September.

A female was taken at Brighton, July 18, 1898, and in the autumn of that year a good many specimens were obtained in various parts of England but chiefly in the south. Portland again heading the list with over fifty (August 4 to October 3) and a number were taken in the Isle of Wight during September. Captures in 1899 seem to have been only pretty good. Portland twenty, August 25 to September 20, perhaps less than a dozen in other parts of England and one in Scotland, all in September

or October. In 1900 one specimen was taken at an Eastbourne electric light, and one at Portpatrick in Scotland, both end of August. There appears to have been an arrival of moths in this country in early June, 1901. Captures were reported from Portland (June 2), Bedford, and S. W. London. Larvæ and pupæ were found in many parts of England, as already mentioned. Then in August, from about the 14th to September, moths were captured throughout the greater part of England; in some places caterpillars were also obtained in August, chrysalids in September. After a lull towards the end of the latter month, moths suddenly appeared again during the first week in October. Several observers remarked that whereas the August to September moths were mostly females, large in size, and not in the best condition, the later moths were chiefly of the male sex, small in size, and fine in condition. It would seem therefore that these late specimens were the descendants of the early August moths and represented a second generation on British soil and the grandchildren of the June immigrants. Or, possibly, the August-September moths were fresh immigrants, and the October specimens their offspring.

The species was observed in several English counties during August and September, 1911; and again in 1915. In 1917 it seems to have been more widely spread over our islands, as specimens were reported from Ireland and even Shetland. It appeared again in 1934/1935.

Plants with tubular flowers, such as those of petunias, and the sweet-scented white tobacco (*Nicotiana affinis*) are its especial favourites, but it also visits the blossoms of pentstemon, geranium (chiefly the scarlet variety), etc. It does not settle on the flowers but inserts its long "tongue" into the tubes as it hovers on the wing in front of them. Just at twilight it commences operations, but it may be seen pursuing its investigations well on into the night (see Fig. 1, p. 2).

Distributed over Europe, Asia, and Africa.

The Privet Hawk (*Sphinx ligustri*).

A specimen of the female sex is figured on Plate 12. The white clouding or mottling on the pale brown colour of the fore wings varies in intensity and is sometimes tinged with pink, especially at the base of the wings; often it is only noticeable at the tips of the wings and on the outer area; the blackish suffusion from the inner margin through the central area and the black streaks between the veins are rather more constant. On the hind wings the pinkish tinge between the black bands may be faint or entirely absent; the central black band varies in width, and is sometimes so much expanded that it absorbs the basal half of the first band.

When full grown the caterpillar measures about three inches in length and has a very substantial appearance. It is of a pretty green colour, with seven oblique white stripes, each of which has a purplish front edging; the spiracles are yellowish. The head is rather more grass green and marked with black in front. The curved horn is blackish on the upper side and yellowish below. The colour of the caterpillar in its younger stage is yellowish, due to the presence of yellow dots, it also has some tiny hairs; the horn, which is bristly and slightly forked at the tip, is a conspicuous feature at this age on account of its length and dark colour as compared with that of the creature itself. Just before changing into the chrysalis, a brownish tinge is assumed, and very rarely caterpillars of a pinkish or purplish tint have been found.

It feeds on privet (*Ligustrum vulgare*) in July and August; often to be seen resting on the upper part of the longer sprays of the food plant. Sometimes a dozen or more may be found on one short strip of privet hedge. They are much subject to the attack of ichneumons. Other food plants are lilac, ash, laurustinus, and some other shrubs. Mr. Step informs me that on

August 18, 1907, he found three larvæ feeding on teasel at Ashtead.

The caterpillar will burrow some depth underground before constructing its pupal chamber. The chrysalis, which is reddish, or blackish-brown in colour, is figured with the other stages on Plate 13.

The moth usually emerges the following June or July, but there are at least two records of its remaining in the chrysalis during two winters.

The southern portion of England appears to be the principal British home of this moth. It is more or less scarce in the midlands and northwards. In Scotland it has only been recorded from southern counties, and in his "Catalogue of the Lepidoptera of Ireland," Kane states that he has no certain record of its occurrence in that country. Widely distributed through central and southern Europe, extending northwards to south Sweden and Finland, and eastwards to Amurland, China, and Japan.

The Pine Hawk (*Hyloicus pinastri*).

Stephens, writing of this species in 1828, remarked that about thirty years before that date, a specimen "was taken in June at Colney Hatch Wood, and a second in the neighbourhood of Esher." He also gives Rivelston Wood, near Edinburgh, as a locality, on the authority of Dr. Leach. A specimen was stated to have been seen in Cumberland in 1827 or 1828, and up to the year 1877 four other examples were reported, each from a different part of England. In the year last mentioned a specimen was recorded from Woodbridge, Suffolk, as taken in a rectory garden the previous midsummer (since ascertained that the moth was first seen there in 1875); an example was also found at rest on a tree trunk at Tuddenham, near Ipswich, in July, 1877, and one was reared on August 5, 1876, from a

chrysalis found near Horham Rectory, Wickham Market, Suffolk. In 1878–9, caterpillars were met with at Leiston, Suffolk; the moth was found in the pine woods around Aldeburgh, 1881, and as many as forty specimens were taken in July and August, 1882, and rather more than twenty in August, 1919. In 1895, Lord Rendlesham, when driving through the fir woods in the neighbourhood of Woodbridge, noted two specimens in almost the same spot where he had taken some moths in 1892–93. Hon. F. Thellusson, writing from this district (August 2, 1895), stated that fifteen specimens had been taken, and that others could have been captured; also that about one hundred larvæ were then feeding in confinement. He also mentioned that 1895 was the fourth year out of five that the insect had occurred there. A male moth was found at rest on an oak trunk near Southwold, Suffolk, on July 29, 1900. On August 13, 1906, the Rev. A. P. Waller saw a worn specimen on a pine trunk in the rectory garden at Woodbridge. He also noted a pupa on September 30, 1917. (Plate 12, Fig. 2.)

The mature caterpillar, which feeds on pine needles, is green, with a yellowish-edged reddish line along the middle of the back and a creamy line on each side of this; the interrupted line below the reddish spiracles is yellowish or ochreous. Head yellowish brown; horn blackish brown; both are glossy. It enters the earth and there turns to a reddish brown chrysalis; this is rather glossy, somewhat darker above than below, and appearing blackish between the rings; the rough "tongue" sheath is short and attached throughout to the case; the tail spike is roughened, and has a blunt point on each side of it (Plate 11, Figs. 3, 3*a*).

It has been recorded that caterpillars hatched from the egg early in August, pupated in October, and the moths emerged the following May–July.

The perfect insect sits upon tree trunks, chiefly pine, often well within reach, although sometimes its position is fourteen or

fifteen feet up the trunk. At night it visits flowers, and seems to be most partial to those of the honeysuckle.

Suffolk and Dorset seem to be the British home of this species but odd specimens have been reported from Romsey, Bournemouth, and the New Forest; Hinton St. George, Herefordshire, Sussex, and Isle of Mull (two larvæ).

The range of this species is through Northern and Central Europe southwards to Northern Spain and Italy, and eastward to the Caucasus. In Japan it is represented by var. *caligineus*, Butler, which differs but little from typical *pinastri*.

The Spurge Hawk (*Celerio euphorbiæ*).

The fore wings are pale grey, more or less tinged with pinkish and marked with olive at the base, towards the middle of front margin, and a tapered band running from the inner margin to the tip of the wing; the lower part of the basal patch is blackish. Hind wings pinkish with black basal patch and a band before the outer margin; a white patch at anal angle (Plate 15, Fig. 1).

The caterpillar feeds, August and September, on spurge (*Euphorbia paralias*, and *E. cyparissias*). When full grown the head is crimson red, marked on the crown with black; the body is black, but so thickly sprinkled with yellow dots that much of the black colour is obscured; the larger spots are often crimson, but sometimes they are yellow, or even cream coloured; the stripes along the back and below the yellow spiracles are crimson, as also are the legs and feet; the spiny horn is crimson with a black tip. In a younger stage the head and the horn are orange, the latter black tipped: the body is yellow with patches of black around the paler yellow spots on the back. Chrysalis pale brownish, minutely dotted with black; the head and thorax are marked with blackish, and the rings of the body have narrow, interrupted, blackish bands; the wing and

Pl. 14.

1, 1*a*. Bedstraw Hawk-moth.
2, 2*a*. Spurge Hawk-moth.
Caterpillars and chrysalids.

Pl. 15.

D 37.

1. **Spurge Hawk-moth.**
2. **Bedstraw Hawk-moth.**
3. **Striped Hawk-moth.**

antennæ cases are covered with fine short blackish streaks; tail spike blackish, somewhat flattened, and the acute point black (Plate 1, Fig. 1; 14, Figs. 2, 2*a*).

The moth usually emerges in June or July of the year following pupation, but it may come out the same year; on the other hand, it has been known to remain in the chrysalis for two winters. Dr. Chapman has noted the emergence of the moth eighteen days after the pupa was formed.

Little, if anything, appears to have been known of this species as an inhabitant of Britain until 1806, when Mr. Raddon, who was staying at Instow, in N. Devon, had a caterpillar brought to him by a fisherman. From that time, and up to 1814, a large number of the caterpillars were obtained from *Euphorbia paralias* growing on Braunton Burrows, a long stretch of sand-hills on the north Devonshire coast, accessible from Barnstaple or Ilfracombe, which, when I visited the locality some twenty-five years ago, was greatly favoured by rabbits. One would suppose that the Spurge Hawk caterpillars must have been pretty abundant at the time Raddon made his observations, as he states in a note on the subject published in the Entomological Magazine for 1835, that on leaving the ground one evening at dusk he hastily cut an armful of spurge, which he took home and put in water. Next morning he "found the food covered with not less than a hundred minute larvæ about a day or two old." This must have happened prior to 1814, because the species seems to have entirely disappeared about that year. The Rev. E. N. Bloomfield, in his catalogue of the Lepidoptera of Suffolk, mentions a moth bred from a larva found near Landguard Fort about 1865. He adds that the food plant was then abundant there. At a meeting of the Entomological Society of London held in October, 1876, a letter was read from Mr. Higgins concerning the reported finding of the caterpillars of this species in a locality near Harwich in 1873. It was stated that the spurge (*Euphorbia paralias*), had not only been

seen in the particular spot, but in other parts of the same district also.

In the *Entomologist* for 1893 there is a very circumstantial account of the finding of eighteen or nineteen Spurge Hawk caterpillars on the Cornish coast in the autumn of 1889. From these, eight moths resulted in May–July, 1890, and one in June, 1891.

Although the occurrence of the moth in Britain has been more frequently recorded, probably in error for the Bedstraw Hawk, there are at least some that are undoubtedly authentic. One of these refers to a specimen taken in a private garden near Southampton (*Entom.*, 1872), and another was captured by the late Mr. C. G. Barrett as it flew at early dusk in a garden at King's Lynn, Norfolk, in September, 1887. In the late Mr. Robert Adkin's collection there is a specimen which was captured in North Devon in June, 1891, also in the British Museum (Natural History) there is another, which was taken in Cornwall in 1909. Since then the species does not seem to have been reported.

Its distribution abroad extends through Central and Southern Europe into Asia Minor, and it is represented by local races in other parts of Asia.

The Bedstraw Hawk (*Celerio galii*).

On Plate 15, Fig. 2, will be found a portrait of this moth, which the ancient fathers of British entomology dubbed the "Spotted Elephant—at least, Harris, in 1778, figured its caterpillar under this name. Later it was called the "Galium Hawk-moth." The olive-brown fore wings have a tapered, creamy-white stripe running obliquely from the inner margin near the base to the tip of the wing; the lower edge of this stripe is almost straight, but the upper edge is irregular; the outer margin of the wings is greyish. Hind wings creamy

white, the basal area and a band before the outer margin black; the space enclosed is blotched, and sometimes tinged with pinkish red; but the extreme inner portion is almost pure white. Head and thorax are olive-brown, edged with white; the abdomen is olive-brown, with a whitish line along the middle of the back, and ornamented with black and white on the sides.

The full-grown caterpillar varies in colour from greenish olive to pale olive-brown, reddish brown, or sometimes blackish; the spots on the back are yellowish, edged with black, but occasionally these are absent. It feeds in August and September, on the bedstraws (*Galium verum*, *G. mollugo*, etc.), preferring the yellow-flowered kind that flourishes on sandhills by the sea (*G. verum*, var. *maritimum*). It can be reared very well on willow herb (*Epilobium*) and on fuchsia.

When ready for the change it burrows underground, and, where the soil is sandy and light, it works down pretty deeply before making the frail cell, in which it turns to a reddish-brown chrysalis with blackish markings, somewhat similar to those of the next species; the anal spike is blackish, rather flattened, terminating in a sharp point (Plate 14, Figs. 1, 1*a*). Haworth in 1812 mentioned caterpillars from Devonshire, and although single specimens of the moth seem to have been taken here and there in various years between that date and 1854, in only one year during that period was it reported from several parts of the country. This was in 1834, when four moths were captured in August, and eight or nine others seen at Yarmouth; caterpillars were also found on the bedstraw growing on the Denes. Odd examples of the moth were observed that year in Lincolnshire, Somersetshire, and in the Isle of Wight. In 1855–56, caterpillars were obtained in August on the sandhills at Deal, and, in September, at Devonport in the first-named year. A moth was taken in May, 1857, and, later in that year, specimens were captured at Deal

Brighton, and Taunton. Three moths were recorded in 1858; and in 1859 caterpillars were plentiful on the south-east coast, common on the Cheshire coast, also reported from Devon, Cambs., London, and Darlington; over a score were found within a short distance of Perth. A good many moths were also taken. The species was especially abundant in 1870, in which year caterpillars were collected in hundreds. It seems to have been widely distributed throughout England, and was again found in Perthshire. Perhaps not more than three specimens were taken between 1872 and 1888, but in the rainy and cold summer of the latter year, the moths seem to have invaded the country in great force, and were reported from many parts of England, and also from Aberdeen in Scotland, and from Howth in Ireland. Caterpillars, too, were plentiful on the coast sandhills of Kent, Cheshire, and Lancashire, and also in the Eastern Counties.

In March, 1889, Mr. Elisha had moths emerge from chrysalids of the previous year. These had been placed in a temperature ranging from 60 to 70 degrees, and the moths came out in from fourteen to sixteen days after commencing the forcing process. Some half a dozen chrysalides that I had in 1888, from Lancashire caterpillars, were allowed to remain in the earth, which was contained in a large-sized flower-pot; the moths emerged in May and June, 1889, all but one being perfect specimens.

In 1894 Mr. Harwood obtained five caterpillars on the Essex coast, and in 1897 the Rev. A. Miles Moss found a few, and observed traces of others, on the Lancashire coast. In 1933 several larvæ were found in Berkshire feeding on *Epilobium*, but apart from these records, very few moths or caterpillars of this species appear to have been noted in the country since 1888, and we still await the advent of another *galii* year.

The range of this insect extends through Europe and Asia to

Siberia and Amurland. It is represented in North America by the Galium Sphinx (*Celerio intermedia*, Kirby = *chamænerii*, Harris), which so greatly resembles it that only an expert could readily distinguish one from the other.

The Striped Hawk (*Celerio livornica*).

Owing to some confusion between this moth (Plate 15, Fig. 3) and the North American Striped Morning Sphinx (*C. lineata*), which also seems to have had a place in the cabinets of the earlier British entomologists, the localities given by authors previous to 1828 are doubtful. Haworth, however, in 1803, mentions Cornwall, and Stephens, in his remarks on this species, refers to a specimen from Norfolk ; one taken off the mast of the Ramsgate steam vessel at Billingsgate, in June, 1824 ; and three specimens, one of which he figured, captured near Kingsbridge, Devonshire.

In 1846 thirteen of these moths were recorded from various parts of England and Ireland, and probably many others were in these islands that year. Between May 12 and 26, 1860, twenty specimens were taken in the south of England, and more than half of them in Devonshire. In 1862 a specimen occurred at Worthing on April 16, and one at Herne Hill on April 29 ; others were taken between May 2 and May 18 on the south and south-west coasts, and at Colchester. Over a score of specimens were recorded in 1868, chiefly in August, and from localities ranging from Cornwall to Yorkshire. The year 1870 was a good one for the species, and moths were reported from England, Wales, Ireland, and Scotland. Fully fifty specimens were obtained, mostly in May, and caterpillars were also found. In 1904 the moth occurred in May, at several places in the south and south-west of England, also in Gloucestershire, Wales, and at Carlisle ; in September of this year a specimen was taken on the pier at Dover, and another on a small

headland at Barry, in Glamorgan. Some of the early captured females deposited eggs; caterpillars resulting therefrom were fed on vine, and at least one moth was reared in September.

A good many specimens visited the south of England, more particularly South Devon, in June, 1906, but the species was reported as occurring in large numbers on rhododendron blossom near Cork in Ireland from June 9 to 13 or 14. In August and September the moth was reported from Kent, Sussex, Hants, Dorset, Devon, Somerset, and South Wales; such specimens probably being the offspring of the early immigrants. During the past forty years the barren seasons for the Striped Hawk appear to have been only ten. The dates of its occurrence have been somewhat erratic. One was captured in 1887 in the month of February, one on March 27 in 1903, but the moth has been observed in each month from May to September inclusive, although May, June, and August would seem to have been the more favoured. The caterpillar has not been seen often in England. Mr. Farn recorded six or seven from Ryde in July, 1870; they were feeding on vine and centaury in a garden. One spun up in the leaves at the bottom of the box on July 27, but the web was so fragile that the caterpillar fell out, and changed to the chrysalis state on the 30th. The moth emerged on August 26. In the same year several caterpillars occurred in Devon and Cornwall, and one of these was found on July 11 in a mangold-wurtzel field in the Exeter district. It was afterwards reared on fuchsia, and produced a moth on August 18. Nine others were reported from a nursery garden at Plymouth; they were fed up on dock—the plant upon which they had been found—and the moth was reared later in the year. In 1902 Mr. Jäger received a caterpillar from Starcross about July 20, and this attained the moth state on September 27. A caterpillar, believed to be of this species, was found in a sunny garden at Lewes in Sussex, July 20, 1906 (see Appendix).

According to Hellins the eggs are light green in colour, and the caterpillars hatch out in about three weeks. When it first emerges from the egg-shell the caterpillar is dirty white without spots, and the head and horn are black ; fully grown it is dark green or black dotted with yellow ; three yellow lines on the back and two rows of black-ringed yellow spots, with some black spots above them ; each yellow spot is tinged with pink on the upper portion. Head black, marked with yellow ; horn reddish, with the tip black. Sometimes the rings of the body are banded.

It feeds in June and July on vine, fuchsia, dock, and probably other plants. It may be noted that the foliage of house vines are stated to be unsuitable food. The blossoms of numerous plants are visited by the moth in the evening, among which are delphinium, petunia, honeysuckle, tobacco, rhododendron, valerian, and silene.

In the daytime it has been found resting on walls, windows, and also the curtains ; on grass turf, railway metals, fences, and on plants and shrubs.

The distribution of this species is somewhat similar to that of the Silver-striped Hawk-moth, but it extends into Western China and is represented in North America.

The Silver-striped Hawk (*Hippotion celerio*).

Referring to this species in 1828 Stephens wrote : "The first recorded specimen of the perfect insect was taken flying in Bunhill-fields burying-ground so long ago as 1779 : and the specimen now exists in a high state of preservation in Mr. Haworth's collection, having been purchased by him at the dispersion of that of Mr. Francillon. Subsequently to the above capture the larvæ have been found several times in Cambridgeshire. . . . Two or three were also taken about fifteen

or sixteen years since in a garden at Norwich, and were kept until they changed to pupæ ; but unfortunately, in that state their metamorphosis ended. One of these pupæ I have in my collection. Of late, however, the perfect insect has occurred more than once, and in totally different parts of the country. Three specimens, as I am informed by the Rev. F. W. Hope, were taken near Oxford several years ago. In August, 1826, an injured one was found resting on a wall near Birmingham ; and last summer a second was secured not far distant from the same locality ; the latter I have in my possession. Again, Mr. Marshall informed me in March last, that, on his way to Manchester, he met with an individual who possessed upwards of a dozen living pupæ, which were procured from larvæ found in that neighbourhood during last season."

Humphrey and Westwood mention a specimen taken in Brighton in 1834, and in 1846 eight moths were obtained. Something like one hundred and twenty-five specimens of this species have been recorded between the year last quoted and the present time. Of these only one occurred in Ireland. This was a specimen taken at light on September 17, 1881, at Mullaghmore, County Sligo. Several were captured in Scotland, and one in Wales ; but the bulk were obtained at various places in England, not in the south only but in the north also. The majority were met with in the autumn, but a specimen was reported as taken in May, 1848, at Harleston, another in March, 1862, at Tooting, and a third in the Isle of Anglesea, July, 1865. In the last-named year nine specimens were captured in the autumn. Doubleday recorded a caterpillar found in a garden at Epping (October, 1867), and other caterpillars have been reported from Newmarket and Sussex.

At least one example of the moth has been recorded almost annually since 1846, but captures seem to have been more numerous in 1861, 1866, 1870, 1879, 1881, and especially so in 1885. The caterpillar (figured on Plate 1) varies in ground

Pl. 16

1. Oleander Hawk-moth.
2. Silver-striped Hawk-moth.

D 44.

brown shaded with greenish, with a whitish, waved cross line. The colours of the head, thorax, and body are similar to those of the wings.

The caterpillar feeds on the Oleander (*Nerium oleander*), and also on the lesser periwinkle (*Vinca minor*). When full grown it is olive green on the back from the hinder part of the third ring to the small, rough, and drooping, horn ; the under surface and the whole of the first three rings ochreous ; there is a divided brown spot on the ring nearest the head (first thoracic segment), and two larger blue-black spots on the third ring. These spots each enclose two whitish clouds ; on the front edge of rings five to nine (second to sixth abdominal segments) are whitish dots, but these are fewer on rings eight and nine than on the others ; a narrow whitish stripe, edged above and below with whitish dots, runs along the sides from ring five to the horn ; spiracles are black with pale margins (Plate 1).

FIG. 18.
Chrysalis of Oleander-Moth.
(Photo by W. J. Lucas.)

Chrysalis brown with blackish central line, which becomes broken and obscure on the body rings, broken again on the head, but continued thence along the under surface to the tips of the wing cases. The spiracles are blackish ; the body is dotted, and the last rings are clouded with blackish.

I have only seen a preserved example of this caterpillar and a dead chrysalis ; descriptions of each are from these.

The first published notification of the occurrence of this moth

in England is that of Stephens in 1835. He wrote : "A noble specimen of this remarkably beautiful insect (five inches three lines in expanse), was taken in the beginning of September, 1833, by a lady in her drawing-room at Dover. Whether the pupa had been imported in some of the numerous packages of foreign fruits, etc., or the insect itself had been brought over in one of the passage-vessels, is a question not easily solved. The larva feeds upon an exotic plant; but has been found in a garden near Charmouth, as appears by a subsequent communication to the *Ent. Magazine* by Captain Blomer."

The next record of the moth appears in the *Zoologist* for 1852. "On the 11th of September a specimen of *Chærocampa nerii* was taken in Montpelier Road, Brighton, by a young gentleman at school, while it was hovering over a passion flower." Two caterpillars were found in a garden at Eastbourne, feeding upon the leaves of potato, in October, 1859. In confinement they ate periwinkle, but they were not reared. The following records are, except where otherwise stated, of single specimens of the moth : Hastings, August 2, 1862 ; Sheffield, September 14, 1867 ; St. Leonards, October, 1868 (? 2 examples) ; Ascot, June, 1873 ; Lewes, September 3, 1874 ; Hemel Hempstead, October 15, 1876; Tottenham, Middlesex, Eastbourne, Sussex, and Blandford, Dorset, September, 1884 ; Hartlepool and Prestwich, July, 1885 ; Brighton, September 7, 1886 ; Poplar, September 20, 1888 ; Dartmouth, September 26, 1890 ; Stowling, Kent, July, 1896 ; Yalding, Kent, September 18, Teignmouth, October 23, 1900 ; Banhead, Scotland, end September, 1901 ; Liverpool, in a steamship, and Atherstone, Warwickshire, October, 1903 ; Eastbourne, July 14, 1904 ; Lancaster, September 18, 1906. A specimen of *Daphnis hypothous*, Cramer, a native of India, Borneo, Java, and Ceylon, was captured at Crieff, Perthshire, in July, 1873, and was recorded as *D. nerii*, and the error was not rectified until 1891 (see Appendix).

It will be seen from the above that the moth is exceedingly

rare in these islands. The species is an inhabitant of Africa, and its normal range extends along both sides of the Mediterranean through Asia Minor and Syria to India. In Europe, north of the Alps, the moth is seldom observed, and it is probably almost as scarce on most of the Continent as it is with us.

The Small Elephant (*Deilephila porcellus*).

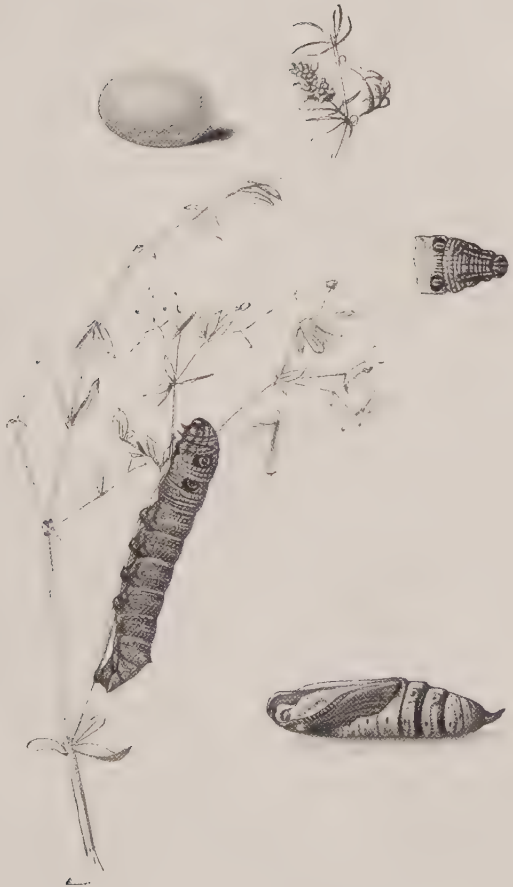
The fore wings of this hawk-moth are ochreous with a faint olive tinge; the front margin is edged and blotched with pinkish, and there is a broad but irregular band of the same colour on the outer margin. Hind wings blackish on upper margin, pinkish on outer margin, and ochreous tinged with olive between; fringes chequered whitish, sometimes tinged with pink. Head, thorax, and body pinkish, more or less variegated with olive; the thorax has a patch of white hairs above the base of the wings (Plate 19, Figs. 3, 4).

In most specimens there are at least traces of two cross-lines in the fore wings, the space between these is sometimes brownish olive; the outer border of the hind wings varies in tint, and may be purplish. Occasionally the ground colour of the fore wings is greenish olive.

A hybrid, resulting from a pairing between *Deilephila elpenor* and *Deilephila porcellus* has been named *elpenorcellus* (Staud.).

The egg is a rich full green and rather glossy; it is laid in June on yellow bedstraw and other kinds of *Galium*.

A full-grown caterpillar will measure quite two inches in length, and in general appearance is not unlike that of the next species. It is, however, greyish brown in colour, merging into yellowish brown on the front rings. The head is greyer than the body; the usual Sphingid horn is absent, and in its place there is a double wart. When quite young the caterpillar



Pl. 18. *D* 48.

Small Elephant Hawk-moth.

Eggs, natural size and enlarged; caterpillar and chrysalis

Pl. 19. *F.* 49.

1, 2. **Elephant Hawk-moth.**
3, 4. **Small Elephant Hawk-moth.**

is pale greyish green with blackish bristles, and the head and under surface are yellowish.

It feeds, at night, in August and September, on bedstraw growing in dry places. It will eat almost any sort of *Galium;* also willow herb (*Epilobium*), and purple loosestrife (*Lythrum salicaria*).

The chrysalis is pale ochreous brown sprinkled with darker brown ; the wing cases and the ring divisions are also darker. The body rings are furnished with reddish hooks. It is enclosed in a cocoon similar to that of the Elephant, and usually is on the ground. The early stages are figured in Plate 18.

The moth, which chiefly affects drier localities than the next species, is on the wing in May and June in the south of England, and June and July in the north. It has a weakness for the flowers of honeysuckle, and spur-valerian (*Centranthus*), but will take toll in the way of sweets wherever found, even from the sugar patches of the nocturnal collector. Except that it does not appear frequently in the Midlands, the species seems to be widely distributed throughout the country. In Scotland its range extends to Perthshire and Aberdeen ; and in Ireland it is found all over the island, and is fairly plentiful in some localities, but especially attached to the coast.

Abroad, its distribution covers nearly the whole of Europe, and eastward to north-eastern Asia Minor, Bithynia, and the Altai.

The Elephant (*Deilephila elpenor*).

The fore wings are olive brown with two pinkish lines, both shaded with dark olive brown ; the first is rather broader than the second, and terminates just above the centre of the wing and near a white dot ; the second line runs from the white inner margin to the tip of the wing, and the area beyond it is flushed with pinkish ; there is a black mark at the base of the wings and the fringes are pinkish. The hind wings are black on the

basal half and pinkish on the outer half; fringes white. The head, thorax, and body are olive brown marked with pinkish, the thorax being additionally ornamented with white on the sides. The moth is shown on Plate 19, and the early stages on Plate 17.

The eggs are whitish-green in colour and rather glossy. Those I had were laid in June on a leaf of willow herb (*Epilobium*).

When newly hatched the caterpillar is yellowish white, and paler between the rings; the head is tinged with greenish, and the horn is black. The full-grown caterpillar measures nearly three inches in length, and is rather plump. It is blackish or brownish grey, thickly sprinkled with black dots on the back and more sparingly on the sides; the spiracles are ochreous ringed with blackish, and below them is an ochreous line, which is most distinct on the front rings; on each side of the third to fifth rings there is a round black spot, the second and third pairs enclosing black centred whitish lunules which are sometimes tinged with pink or yellow; the horn is much of the same colour as the body. There is a green form of this caterpillar.

It feeds, chiefly, at night, in July and August, on *Epilobium hirsutum* and on bedstraw especially the kind (*G. palustre*), growing by the side of brooks and streams. The chrysalis is palish brown freckled with darker brown, the divisions between the rings and the spiked tail appearing blackish; enclosed in a cocoon formed of earth and sundry fragments of stalks, leaves, etc., spun together with silk and generally on the ground, but sometimes just under the surface.

The moth is on the wing in June, and very occasionally there is a late summer emergence. It does not fly until dusk, and may then be seen hovering over the blossoms of honeysuckle, etc. It is also known to be attracted now and then to "sugared" trees. The best plan, however, for obtaining a few fine specimens

is to rear them from eggs or caterpillars. The latter are said to come up to sun themselves about four o'clock in the afternoon, but they may be found at any time in their season, and in likely spots, by turning back the herbage and looking for them in their hiding-places. When in repose the head and front rings are drawn inwards, and this distends the eyed rings, thus bringing these into prominence and giving the creature a rather wicked look, from which the uninitiated would be likely to retreat. The caterpillar, however, is quite harmless, and may be handled with impunity.

Although somewhat scarce in the more northern counties, this is a pretty common species throughout most of England and Wales. Its range extends into Scotland as far as Dumbarton, and, according to Barrett, along the east coast to Aberdeen. Kane states that in Ireland it is met with everywhere and is abundant in some localities. Distributed over Europe, except the more northern parts, and extending through Asia to Japan.

The Humming-bird Hawk-moth (*Macroglossum stellatarum*).

The brown fore wings with black cross lines, and the brownish bordered orange hind wings, at once separate this from any other hawk-moth occurring in our islands. Its greenish eggs are laid on bedstraw, and in July and August the caterpillars may be found on the same kind of plant. They are greenish or brownish covered with white dots ; a whitish line runs along each side of the back and a yellowish one lower down on the sides ; the spiracles are blackish, and the horn bluish shading into yellow at the tip. The yellow-flowering bedstraw (*Galium verum*) seems to be the kind upon which the caterpillar is most often found, but it also occurs on the hedge bedstraw (*G. mollugo*). It has been known to eat wild madder (*Rubia peregrina*), and is

stated to thrive in confinement on goose-grass or cleavers (*G. aparine*). When full grown a loosely woven cocoon is formed on the ground beneath the food plant, or other herbage, and therein the caterpillar changes to an ochreous grey or brownish chrysalis. This is marked with darker brown on the wing covers and around the spiracles ; the "tongue" case forms a small beak-like projection.

Like the Bee Hawks, referred to presently, the moth is a day flyer, and delights in the sunshine, although it has been several times seen on the wing quite late in the evening, and has also been observed hovering in front of flowers and probing them with its long "tongue" even in the pouring rain. Blossoms of very many plants, both wild and cultivated, seem to receive its attention, but it is perhaps most partial to those of the jasmine where available. In the south of Europe the species is generally abundant throughout the year ; but there would seem to be at least two distinct broods, one appearing in June, and the other in October. Possibly there may be an intermediate brood in August, as the period from egg to moth is known to be less than two months. In the British Isles, so far as one can gather from the records, caterpillars have only been found in July and August. Single specimens of the moth have been seen in the earliest months of the year, as for example, January 31, 1898 (Bath), January 3, 1899 (S. Wales), February 2, 1900 (London) ; it has also been observed several times in December. These facts and others connected with this species in Britain certainly lend colour to the oft-repeated statement that the moth hibernates in this country. The insect is known to enter houses, and to examine holes and cracks in walls, dry banks, etc., in the autumn. Mr. J. P. Barrett, in a note, written in November or December, 1900, states that six or seven moths came into his house at Margate in October, and that one was still hidden in his bedroom. However, if it be granted that the moth does hibernate here, the instances are so rare and isolated that,

Pl. 20. *E* 52.

1. Narrow-bordered Bee Hawk-moth: *caterpillar.*
2, 2*a*. Broad-bordered Bee Hawk: *caterpillar and chrysalis.*

Pl. 21.

1. Humming-bird Hawk-moth.
2. Broad-bordered Bee Hawk-moth, *male*; 3 *female*.
4. Narrow-bordered Bee Hawk-moth, *male*; 5 *female*.

unless such specimens are impregnated females, the chances of these reproducing their kind the following year are not great. We have, therefore, to fall back upon immigration as the probable source of the Humming-Bird Hawk-moth in Britain. Except the more northern portion, this species is distributed over the whole of the Palæarctic region, including India, China, Corea, and Japan.

The Broad-bordered Bee Hawk-moth (*Hemaris fuciformis*).

We have but two kinds of Bee Hawk-moths in our islands, and the present species (Plate 21, Figs. 2, 3) is easily recognized by the broad reddish brown borders of the wings and especially those on the front pair, which also have a black bar at the end of the cell. When freshly emerged the wings are not clear and transparent, but covered with greenish-grey scales, which are so loosely attached that they are lost after the moth's first flight.

The egg is bright green, and is laid on the underside of a leaf of honeysuckle. When very young the caterpillar is yellowish white, but when full grown (Plate 20, Fig. 2) it is whitish green on the back, green on the sides, and reddish brown beneath. Along the middle of the back there is a darker, much interrupted, green line and a yellow line on each side of it; the spiracles are reddish, the head is dark green, and the horn reddish brown merging into violet at the base, and brown at the tip. Sometimes there are blotches of reddish brown on the sides. When quite mature and ready to assume the chrysalis stage the caterpillar changes in colour to purplish brown. At all times it is difficult to detect, as its colour and markings agree so well with the stems, stalks, and leaves of the food plant. If a leaf of honeysuckle having round holes on each side of the midrib be noticed, examination of the underside of that leaf may reveal a young caterpillar of this species.

The common honeysuckle, or woodbine (*Lonicera periclymenum*) is the usual food, but in confinement the caterpillars will eat the foliage of the cultivated kinds of *Lonicera*, and, it is stated, even snowberry (*Symphoricarpus racemosus*). In rearing it will, however, be safer to supply them with the ordinary food wherever this is to be obtained. July and August are the months in which to look for them. The chrysalis is blackish brown, the skin is rather roughened, and the ring divisions are paler brown. It is protected by a silken cocoon, the interior of which is smooth, and the exterior coated with earth, etc.

From mid-May to mid-June in average years, the moth is on the wing. The blossoms of the rhododendron are its favourite attraction, and the best time to see it at these flowers is on a nice sunny morning between ten o'clock and midday. The flowers of the bugle (*Ajuga reptans*) growing in meadows, wood-ridings, on railway banks or hedgerows, are hardly less attractive, but these are less easily worked than the higher shrubs. The collector has simply to stand before the latter and await the arrival of the active Bee Hawks. Among other flowers that this moth has been observed to visit are those of its own food plant; ragged robins (*Lychnis flos-cuculi*), ground ivy (*Nepeta glechoma*), and also blue-bell and primrose.

The species is widely distributed and locally common throughout England, but its northern range does not extend apparently beyond Yorkshire. According to Kane it is absent from Ireland; and the reports of odd specimens from Scotland are probably erroneous. Its distribution abroad extends over Europe, except the most northern parts, a large portion of northern and central Asia, and southwards to North Africa.

Moses Harris, it may be mentioned, figured this moth in 1775 as "The Clear-winged Humming-bird Sphinx."

The Narrow-bordered Bee Hawk-moth (*Hemaris tityus*).

This moth (Plate 21, Figs. 4, 5) has long been known as "*bombyliformis*" and was so mentioned by Haworth in 1802, but for some years past there has been a growing tendency to discard the name altogether, and as most recent authors follow Kirby's identification of this species as the *tityus* of Linnæus, that name is here adopted.

The chief characters separating this moth from the preceding are the narrow blackish borders of the wings and the absence of the black mark at the end of the cell of fore wings. The female deposits its green oval eggs on the undersides of the leaves of devil's-bit scabious (*Scabiosa succisa*) and she will lay freely in a box.

The caterpillar (Plate 20, Fig. 1) is green, roughened with white points, from which tiny hairs arise; the green colour varies in tint from whitish to bluish; the lines along each side of the back are yellowish, and often have purplish red spots, or patches, upon them; the spiracles are set in purplish red patches, and the roughened reddish-brown horn is finely pointed. The under side is traversed by a purplish-red stripe. There is some modification in the reddish markings, both as regards number and intensity; these are well developed in the specimen from the New Forest figured on Plate 20. The caterpillars may be found in June and July on the under sides of the lower leaves of the scabious, and as they eat holes in the leaves these marks should afford a clue to their whereabouts.

A few days before changing to a dark brown chrysalis, which is enclosed in a coarse and very loosely constructed cocoon, the caterpillar assumes a reddish colour.

This moth, which much resembles a large humble bee, is on

the wing from about the middle of May to the middle of June. It should be looked for in places where its food plant flourishes such as rough fields adjoining woods, woodland glades, marshy heaths, fens, bogs, etc. It visits the blossoms of various low growing plants, among which the louseworts (*Pedicularis palustris* and *P. sylvatica*) and the bugle (*Ajuga reptans*) are perhaps favourites. In some localities the blossoms of the rhododendron and of the bird's-foot trefoil (*Lotus corniculatus*) are very attractive. When seen hovering over the flowers it must be approached cautiously, as, although seemingly fully engrossed in the business in hand, it is quickly alarmed and its movements are rapid. Its flight is over by midday.

It occurs throughout the greater part of England and Wales and northwards to Sutherlandshire in Scotland. In Ireland it is abundant in many localities.

Distributed over Europe its range extends northwards to Lapland, southwards to north-west Africa, and eastward to Amurland.

Prominents (*Notodontidæ*)

In the majority of our moths belonging to this family there is a tooth-like tuft of scales projecting from about the middle of the inner margin of the fore wings ; these, when the moth is resting, are brought together and raised above the level of the closed wings (see Fig. 11, page 11). The antennæ of the male are bipectinated in most of the species, but those of *Odontosia*, *Lophopteryx*, and *Phalera* are dentated and each tooth has a little tuft of short hair.

The moths are not often seen in the day time, but a few species are sometimes met with at rest on tree trunks, palings, etc. All fly at night and are pretty rapid on the wing ; possibly if it were not for the fact that a bright light has a powerful attraction for them, the perfect insects would be rarely captured.

Specimens, when caught, except females which it may be well to keep for eggs, should be killed and pinned at once, as many kinds become very restless when imprisoned in a box and soon damage themselves. Females usually deposit their eggs freely, and in most cases the caterpillars are not difficult to rear when once they begin to feed. Sometimes it is not easy to induce them to commence this very necessary business. The caterpillars, except those of *Phalera* and *Clostera*, are without hairs on the body; those of the true Prominents generally have one, or more, hump on the back; in some kinds the anal prolegs or hind claspers, are small. When resting the hinder part of the caterpillar is more or less raised, several of them elevate the front portion also, and frequently the posture assumed is a most curious one.

The caterpillars of the genera *Cerura* and *Stauropus* have the hind claspers transformed into tail-like appendages, which in the case of the Puss and Kittens take the form of a pair of slender tubes furnished with flagellæ, or whips, which can be protruded or withdrawn as occasion may require. These organs are presumably for defensive purposes, but are not always effective in combating the attack of parasitical flies, as these evidently manage to deposit their egg on the caterpillars not infrequently.

The pupa, or chrysalis, of some kinds is enclosed in a hard cocoon on tree trunks, and others in a soft cocoon generally underground; sometimes, however, the cocoon is spun up between leaves; occasionally, as for example that of the Buff-tip, the chrysalis is found in the ground without any protecting covering, although the cell in which it was formed may have been flimsily lined with silk.

Nearly one hundred species are referred to this family in Staudinger's "Catalogue of Palæarctic Lepidoptera," and of these twenty-five occur, or have been taken, in the British Isles, nearly all of which are accepted as indigenous. Two of the

three species not generally regarded as true natives have been found in the caterpillar state, and the third was reared from an egg obtained with others of the same kind in Norfolk.

The Alder Kitten (*Cerura bicuspis*).

This moth (Plate 22, Fig. 3) differs from either of the two next following in being whiter, and in having both margins of the central band of the fore wings angled or bent inwards above the middle; this is markedly so on the outer side. The band itself is black, inclining to purplish rather than grey. Barrett mentions a specimen without central band or cloud towards tip.

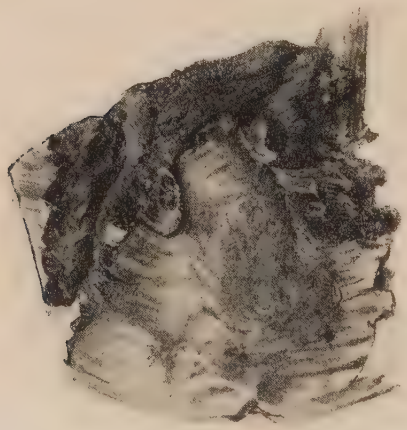


FIG. 19.
Cocoon of the Alder Kitten.

According to Buckler, the caterpillar is yellow-green; head dark reddish-brown; at the back of the head commences a broad, reddish-brown blotch, which runs to a point on the back of the third segment, where is a slight elevation; on the fourth it recommences and becomes broader on each segment to the eighth, where it extends below and encloses the spiracles, thence it narrows to the tenth, continuing on the eleventh and twelfth as a broad stripe, and

widening on the thirteenth, where it again narrows to the tentacles; in the broad portion of this dorsal marking are faint indications of two or three orange spots; on each side it is broadly edged with pale yellow, and on the sixth, seventh, and eighth segments its margin is deeply indented. It feeds on alder and birch in July and August.

The cocoon is shown in its natural position on birch bark (Fig. 19). This was kindly lent to me for figuring by Mr. L. W. Newman, of Bexley, who also had another in which lichen as well as fragments of bark were worked into the surface, so that the cocoon was less in evidence than the one portrayed.

The moth emerges in May and June.

The first British specimen, a male, was found on alder near Preston, and was recorded by Doubleday in the *Zoologist* for 1847. A second example was noted from the same locality in 1849. This district in Lancashire, and Tilgate Forest in Sussex, are the chief homes in the north and the south of England respectively; but one or more specimens have occurred in Cheshire, Herefordshire, Oxfordshire, Norfolk, Suffolk, and Devonshire and more frequently in Staffordshire, Derbyshire, and Yorkshire. It does not seem to inhabit Scotland or Ireland, neither has it been recorded from Wales, so far as I can find, more than once.

The species is found in Germany, Switzerland, Eastern France, Belgium, Southern Sweden, Central Russia, Livonia, Finland, Ussuri, and a local race occurs in Amurland.

The Poplar Kitten (*Cerura hermelina*).

Fore wings grey, with a broad, dark grey central band, and a cloud of the same colour towards the tips of the wings; the band is inwardly margined by an almost straight black line, and outwardly by a curved line; the third line is double, and curved towards the costa, forming the inner edge of the grey cloud, the lower part is wavy. The first black line is inwardly, and

the second outwardly edged with ochreous, and preceding the first is a series of black dots.

The full-grown caterpillar, which is green, with a yellow-edged, purplish, irregular stripe on the back, is figured on Plate 23, together with a very young example, the purplish-black eggs as laid, and the red-brown chrysalis. The cocoon from which the chrysalis was extracted was spun up on a fairly stout twig of poplar, from which some of the bark had been torn ; the cocoon was formed, as regards the upper part, on the bare twig, and this was covered with gnawed wood, instead of with bark fragments, as is the lower end. The moth is figured on Plate 22, and the early stages on Plate 23.

The moth emerges in June, sometimes in July, and may occasionally be found at rest on the trunks of poplars, on which the caterpillar feeds from July to September ; also on adjacent walls or palings. The cocoons are made up on the surface or in the chinks of the bark, and may be searched for, all through the winter and early spring. It is curious to note how readily these are detected after the moth has escaped, and how difficult they are to see before that event. Usually there is but one brood in the year, but in the hot summer of 1906 a male specimen emerged from a few chrysalids that I had reared from eggs laid at the end of June of that year. On the other hand, the moth has been known to remain in the chrysalis for two winters.

The species is not uncommon in some parts of the London district, and seems to occur throughout England wherever poplars abound. It does not appear to have been found in Scotland, and is scarce in Ireland. Abroad it is found in Central Europe with a northern range to Finland, southwards to Italy and Greece, and eastwards to the Altai.

Pl. 22.

E 60.

1. Poplar Kitten-moth, *male*; 2 *female*.
3. Alder Kitten-moth, *male*.
4. Sallow Kitten-moth, *male*; 5 *female*.

Pl. 23.

F. 61.

1, 1*a*, 1*b*. **Poplar Kitten :** *eggs, caterpillar and chrysalis.*
2, 2*a*. **Sallow Kitten :** *eggs and caterpillars.*

The Sallow Kitten (*Cerura furcula*).

This moth differs from the last in its generally smaller size, but more especially in the shape of the black line forming the outer margin of the central band ; this is always more or less angled or dentate towards the front margin of the wings, whereas, in the Poplar Kitten, this portion of the line forms a clean curve. The band on the hind wings is not quite so broad and is further away from the margin than it is in *C. hermelina* (Plate 22, Figs. 4, 5)

The eggs are black, rather glossy, and are generally deposited in pairs, but rarely more than three, and often only singly, on the upper surface of a leaf of sallow or willow. The caterpillar feeds from July to September, sometimes as early as the end of June, or as late as October. It is green, with a yellow tinge ; the markings on the back are similar to these characters in the caterpillar of the preceding species, but, as will be seen by looking at the figures on Plate 23, they are not quite the same in outline. The figure of the young caterpillar on this plate was made soon after it left the egg, and the shell from which it emerged is also depicted. Sallow and willow are the usual food plants, but in August, 1906, I found a half-grown caterpillar of this species on aspen, but it died a few days afterwards. The reddish-brown chrysalis is enclosed in the usual hard cocoon of its kind, which is affixed to a branch or the trunk of the tree upon which the caterpillar fed. A depression is usually selected, and when the cocoon is finished off with its covering of bark fragments it is difficult to see.

The species is well distributed over England, Ireland, and Scotland ; perhaps more frequently obtained on the mosses of Cheshire, Lancashire, and Yorkshire, than in other parts of England. It is found in Central and Northern Europe, and, according to Staudinger, in Amurland and North America.

The Puss Moth (*Cerura vinula*).

Portraits of both sexes of this rather common moth are given on Plate 24. The head, thorax, and body are very fluffy. The whitish fore wings are crossed by several wave-like lines ; the main veins (*nervures*) are ochreous, and the branches (*nervules*) are blackish ; beyond the more or less clear basal area there is often a broad but irregular blackish band, and the wavy markings on the outer area vary in intensity (sometimes the short streaks between the veins terminate on the outer margin in black dots). Hind wings whitish in the male, and suffused with blackish in the female, to a greater or lesser extent. In some examples of the female the fore wings and the body are also tinged with blackish. The antennæ are bipectinated in both sexes, but those of the female have the teeth much shorter than those of the male.

The eggs are usually laid in pairs on the upper surface of a leaf of sallow, willow, or poplar. In colour these are purplish or reddish brown, shining, and finely grained ; a minute depression at the top is yellowish, with a black speck at the bottom of the hollow.

In its last stage the caterpillar is green, with a white or yellowish-edged purplish brown band on the back ; the head is light brown margined with black and purplish behind, and the ring immediately following (first thoracic) is green margined with yellow and having two black spots on the upper part. When the creature assumes the position which Professor Poulton terms the terrifying attitude, the front part is elevated, the head is drawn back into the ring next to it, and the tails are raised and curved forward over the back (see Plate 25). Seen thus from the front the appearance of the caterpillar is certainly grotesque, and no doubt affords it some protection from its enemies. It feeds on poplars, sallows, and willows, usually in July and August, but sometimes as late as September.

The reddish brown chrysalis is enclosed in a hard cocoon spun up and securely attached to the trunk or under a limb of the tree upon which the caterpillar was nourished, or upon some other adjacent thereto. I once found a cocoon on the lower rail of a garden fence. In constructing the cocoon fragments of bark and wood are worked on the exterior, but failing these the caterpillar will make use of any available material for the purpose. If enclosed in a tumbler covered with glass it will spin a transparent cocoon. Emergence from its strong pupal chamber would appear to be a difficult matter, but the caterpillar and the chrysalis both contribute something towards assisting the final efforts of the moth to escape. The caterpillar, in constructing the cocoon, is careful to make the exit end with a thiner layer than the other parts ; then the chrysalis is provided with a cutting implement in the shape of a keel-like arrangement on the fore part, and with this it operates at the right time on the weak end until a breach is made ; the moth breaks the head end of the chrysalis case and moistens

FIG. 20.
Caterpillar of Puss Moth.

the ruptured material with a softening fluid so that the insect is able to force its way out of the cocoon ; the chrysalis case remains in the cocoon.

The moth is on the wing in May and June, and sometimes July. Three specimens that I reared this year (1907) from eggs found on a leaf of poplar last year, emerged on June 4th, 10th, and July 12th. They all pupated about the same time, and side by side on cork bark.

I believe this species has not been recorded from the Orkneys or the Shetlands, but with these exceptions it seems to occur in more or less frequency throughout the United Kingdom. It is widely distributed in Europe, and its range extends to Siberia. In Lapland, Amurland, Japan, and North Africa it is represented by named forms.

The Lobster (*Stauropus fagi*).

The English name of this insect does not apply to the greyish brown or sometimes blackish moth (Plate 26), but to its remarkable caterpillar, the figures of which, on Plate 27, are reproduced from drawings by Mr. Alfred Sich. In colour this curious-shaped creature is always some shade of brown, the head is marked in front with reddish, the ring divisions of the body are darker brown, and the hind rings are reddish brown.

The late Mr. W. H. Tugwell, referring to the early history of these caterpillars, states that a female of the blackish form received from Reading in May was kept alive for seven days, during which time she laid a few eggs on oak leaves each night ; "all told" she produced forty eggs. As she was then quite exhausted, a good many had probably been laid previously. The eggs when first laid are of a pale cream colour, hemispherical in shape and flattened beneath. About the seventh day a circular depression, and a dark spot, appear, and

Pl. 24. **Puss Moth.** *E 64.*

Pl 25. F 65.

Puss Moth.

Egg, natural size and enlarged; caterpillars, chrysalis and cocoon

gradually the entire egg assumes a dull purplish colour. "On the tenth day the caterpillars hatch out. When they first leave the shell they appear extremely large, this is partly on account of the long legs and the caudal appendages which are ever nervously twisting about. The young caterpillars most carefully keep guard over their own egg-shell, which is to them an all-important item, as this provides them with their first meal—the first and only food they take for seven days, in fact, for a longer period, as it is not until after moulting their first skin that they eat any other food. This fact I proved over and over again, as, being an invalid, my time was quite free to watch them hour after hour and day after day. As soon as they have eaten their way out of the shell they stretch themselves, and then from time to time nibble portions of the white chitinous-looking egg-shell, and a tough morsel it seems to be for them ; but they never leave it for more than an inch or so, and then rapidly come back. They keep nervously moving around and about this, and if perchance another caterpillar should approach within touch of it, a vigorous attack is made to drive off the intruder. All going well during the first hour or two, the whole of the shell, or sometimes not more than from half to two-thirds of it is consumed ; and once the caterpillars really leave the egg-shell, that is, walk away from it, they do not touch it after. If by any chance a young caterpillar gets driven away from the egg-shell, death is certain to result, as I could never induce them to feed on portions of empty shells left by others ; nor would they eat the leaves or the brown stipules of the beech, which it has been suggested they do eat. In no single instance did they eat other food in their first skin save and alone the one meal of their own egg-shells."

The caterpillars feed on beech, and also occasionally on birch, oak, hazel, and some fruit trees, and may be found from July to September.

The chrysalis, which is enclosed in a tightly woven cocoon

spun up between leaves, usually dead ones, is blackish brown with a violet bloom upon it.

The moths are on the wing in May and June in an early season, but not until June and July in a backward one. They may be sometimes found resting by day on the stems of small trees or even bushes. "In fact, anything," Mr. Holland says, "which stands upright in a beech wood will do, so that it is not too large." The blackish form of the moth is so like a knot on a stem that it is easily overlooked. There is sometimes a second emergence in August. Possibly those caterpillars found during the latter part of September in some favourable years are from eggs deposited by moths emerging in early August, and the offspring of May parents.

The species is widely distributed, but not often common, over the Midland, Southern, and Eastern Counties of England. It seems to flourish chiefly in beech woods, and is perhaps more frequent in parts of Berkshire, Bucks, and Oxfordshire, than elsewhere, but it is not uncommon in some seasons in the New Forest. It has been reported from Swansea in Wales, and once from Selby, Yorkshire. In Ireland it is exceedingly rare, and is not known to occur in Scotland. The range abroad extends through Central Europe, northward to Sweden, southward to Spain and Portugal, and eastward to Armenia, Ussuri, and Japan.

The Dusky Marbled Brown (*Gluphisia crenata*).

Only three authenticated British examples are known of this dingy grey-brown moth (Plate 28, Fig. 3). The earliest intimation we have of the occurrence of this species in England is the following record by the late Mr. Henry Doubleday in the *Entomologist*, vol. i. p. 156: "*Chaonia crenata*. The first British specimen of this insect was taken in Ongar Park Wood, in June, 1839; a second in the same place, in June of the present year. Both

Pl. 26. *F* 66.

Lobster Moth.

Pl. 27. F 67

Lobster Moth.

Egg, enlarged, caterpillars, chrysalis and cocoon.

specimens were females." The locality mentioned in the foregoing notice which was penned July 10th, 1841, is in the County of Essex. At a meeting of the Entomological Society of London held in April, 1854, the Rev. Joseph Greene exhibited a specimen that he had reared from a caterpillar obtained from a poplar near Halton, in Bucks, August, 1853.

According to Buckler the caterpillar is pale green, with a thin whitish line down the middle of the back, a broader yellow line on each side, and some reddish spots on the front and hind rings of the body ; the spiracles are black. It spins a somewhat oval-shaped cocoon between two poplar leaves, and therein turns to a glossy blackish brown chrysalis.

Abroad the species is found in Central Europe, North Italy, North-western Russia, Southern Norway, and also in Amurland and Ussuri. There are said to be two broods on the continent, one emergence of moths taking place in April and the other in June or July.

The Marbled Brown (*Drymonia trimacula*).

Somewhat similar to the next species, but the fore wings are generally whiter ; the cross lines are not so straight, and there is no black crescent above the centre of the wings (Plate 28, Fig. 1).

The caterpillar is green, with two yellow lines on the back, and a yellow one along the spiracles, the latter edged above with reddish. It feeds on oak, and may be found from July to September ; stated to hide by day in the chinks of the bark. The reddish brown chrysalis is enclosed in a cocoon of earth held together with silk. It may be searched for at the roots of grass, etc., around the foot of oak trees growing in parks or in the more open parts of woods. The moth appears in May.

Although nowhere really common, it seems to occur pretty generally over the southern portion of England, and as far north

as Derbyshire and Staffordshire. Farther north, and in Wales and Scotland, it has been rarely met with. Recorded by Birchall to be not uncommon at Killarney ; and by Donovan from Ummera and Glengariff.

The species occurs locally throughout Central Europe, also in Transylvania, Northern and Central Italy, and Eastern Armenia. In Ussuri, and Japan, it is represented by the form *dodonides*, Staud.

The Lunar Marbled Brown (*Drymonia ruficornis*).

The fore wings of this moth (Plate 28, Fig. 2) are dark fuscous, almost blackish, a short white line near the base ; the central third is white clouded with the ground colour and limited by white edged black wavy lines ; a black crescent just above the centre of the wing. Hind wings smoky grey with a pale curved line. The egg, which is bluish white in colour, is of the usual Notodont shape. Caterpillar green, merging into bluish-green on the back ; the lines are pale yellow, or creamy white, that along the black margined spiracles is rather broad and is sometimes tinged with reddish on the three front rings. Head green, mouth marked with pale yellow. Feeds in June, July, and August on oak. From about a dozen eggs that I had in May, 1907, the caterpillars hatched on the 13th of the month. Only one got through safely to the chrysalis stage which it reached at the end of June. On June 26th some half-grown and smaller caterpillars were received from the New Forest, only one of these was seen on July 19th, but it was then nearly full grown and appeared to be quite healthy, and others had pupated or died.

The chrysalis is deep red brown, enclosed in a silken cocoon covered with particles of earth ; generally found at the roots of isolated oak trees (Plate 29, Figs. 1, 1*a*).

The moth emerges in May, sometimes at the end of April,

Pl. 28. *F* 68.

1. Marbled Brown Moth. 2. Lunar Marbled Brown.
3. Dusky Marbled Brown. 4. Swallow Prominent, *female*; 5 *male*.
6. Lesser Swallow Prominent.

Pl. 29. F 69

1, 1*a*. Lunar Marbled Brown : *caterpillar and chrysalis*
2, 2*a*, 2*b*. Swallow Prominent : *egg, caterpillar and chrysalis.*
3, 3*a*, 3*b* Lesser Swallow Prominent : *egg, caterpillar and chrysalis*

generally in the afternoon ; it sits on the tree trunk to expand and dry its wings, and then ascends higher up the tree. It is found in Berkshire, Buckinghamshire, and in most of the southern counties of England, and in the west, but it seems to be rarer eastward and northward, and also in Scotland. In Ireland it is distributed locally, north and south.

The range abroad is very similar to that of the next species.

The Swallow Prominent (*Pheosia tremula*).

Normally whitish, with a brown shaded black stripe along the inner margin of the fore wings, and a brownish cloud, with black streaks in it, towards the tips of these wings ; the outer extremities of the veins are white, there is a white wedge-shaped streak between veins 1 and 2, and from the apex of this an indented white line runs to the base of the wing. Sometimes the whole discal area is suffused with brownish. The moth is shown on Plate 28, Figs. 4, 5, and the early stages on Plate 29, Figs. 2, 2*a*, and 2*b*. The egg when laid is creamy white, and the newly hatched caterpillar is pale green. When full grown the caterpillar is green with rather darker, but not always clearly defined, lines along the back, and a yellow line along the region of the black spiracles ; the underside is sometimes reddish. Another form is brownish in colour and the yellow line is then generally obscure. The green form is figured on Plate 29. The usual food is poplar, but sallow is also eaten. It may be found in late June and early July and again in September and October. The chrysalis is reddish brown and glossy except on the wing covers, which are granulated and appear darker. The cocoon is roughly constructed of silk and earth, and before spinning it the autumnal caterpillar sometimes burrows a good depth under the surface of the soil ; the summer cocoons are said to be made up among leaves. The moth is on the wing in May and August.

The species is perhaps most common in the southern and eastern counties of England, but seems to be pretty generally distributed throughout the country, and extends into Scotland as far as Moray. In Ireland it has a wide range and is not uncommon in some parts. Abroad it is found in Central and Northern Europe, and as far east as Amurland and Ussuri. In America it is represented by *P. dimidiata*, H.-S., which does not seem to be really specifically distinct.

The Lesser Swallow Prominent (*Pheosia gnoma*).

Very similar to the last species, but generally smaller, and the ground colour has usually less brown in it; the chief character, however, by which it may be distinguished, is the broader and clearer white wedge-shaped mark between veins one and two on the fore wings. Reference to the figures of each species on Plate 28 will show this at once.

The eggs are greenish white, and the full-grown caterpillar is purplish brown on the back merging into violet on the sides; there is a broad yellow stripe along the spiracle area; the head is violet, faintly marked with black. A noticeable feature of this caterpillar is its varnished appearance. It feeds on birch in June and July, and sometimes in September and October. The early stages are figured on Plate 29, Figs. 3, 3*a*, and 3*b*.

The distribution is similar to that of the last species but it seems to be commoner in the north of England and Scotland than elsewhere. It is also plentiful in Ireland. It appears in May/June and again in July/August.

The Pebble Prominent (*Notodonta ziczac*).

This moth varies in the colour of the fore wings from pale ochreous brown to a darker brown tinged with reddish; the usual pale greyish patch in the middle of the costal area is

sometimes obliterated by a suffusion of the darker colour ; the dark-brown first and second lines are often only visible towards the front edge of the wings ; a blackish lunule or crescent forms, in conjunction with the strongly curved outer line, the outline of the characteristic pebble-like mark on the apical area of the wings ; a pale saw-edged line, which is inwardly shaded with dusky and intersected by black streaks on the veins, traverses the pebble mark, but in the lighter coloured specimens this line is not traceable. The female has browner hind wings than the male. The moth is depicted on Plate 31, Fig. 2; and the early stages on Plate 30, Figs. 1, 1*a*, and 1*b*.

The caterpillar, when full grown, is pale ochreous grey, sometimes tinged with pink or purplish brown, or with yellowish, and especially on the hind rings ; a yellow stripe along the back is edged here and there with brownish ; the diffuse dusky line along the area of the black margined spiracles is edged with yellowish. It is occasionally found on poplar, but sallows and willow are the more usual food plants, and it feeds upon these in June and July and again in August and September. The reddish brown chrysalis is enclosed in an earthen cocoon just under the surface of the ground at the roots of tree or bush upon which the caterpillar fed. The moth emerges in May and June from chrysalides of the previous year, and in August as a second generation. Three broods in the year have been obtained in confinement, but this is probably exceptional.

Widely distributed throughout the British Isles, but seems to have a preference for fens and marshy ground. It occurs all over Central and Northern Europe, its range extends through France to Spain, Italy, and Corsica, and it has been recorded from Armenia and Amurland.

The Iron Prominent (*Notodonta dromedarius*).

The specimen shown on Plate 31 is from Surrey, and represents the form most frequently obtained in the south of England. Northwards the species becomes darker in colour, and the reddish and yellow marking much reduced. The form *perfusca*, as figured by Stephens, has the fore wings dark purplish grey, streaked with dark brown; a pale patch at the base is russet marked, the line before the middle of the wing is russet, and a dash of the same colour lies at the lower extremity of the line beyond the middle; the hind wings are brownish grey with a broad whitish cross line. The specimen, which is of the female sex, was from Dublin, and the form was not then supposed to occur in any other part of the British Isles. It is now, however, well known in Scotland and the North of England, and also in Ireland. Some examples that I have seen from Scotland are much larger and darker than the figure referred to. In his description of this form Stephens states that the fore wings are fuscous mixed with chestnut, with darker clouds. The caterpillar, which is figured on Plate 30, is green, becoming yellowish on the back; a rather broad stripe on the back of the front rings and the markings on the humps and on other parts of the body are purplish brown. It feeds on birch, alder, and sometimes hazel, usually on the former, in June, July, and August. In some seasons, and localities, the moth appears twice in the year: the caterpillar may then be found in September and October. The chrysalis is blackish-brown and rather glossy, enclosed in a cocoon composed of silk and sand or other soil, and may be obtained by lightly digging up the earth and sods at the roots of trees.

The Three Humped (*Notodonta phœbe*).

Very little is known in Britain of this Central European moth (Plate 31, Fig. 3). The first specimen of which we have any

knowledge was reared on August 10, 1842 from a caterpillar found in Essex on aspen. This example was included, with two others, one of which was captured in Suffolk, in the collection of the late Dr. Mason, which was dispersed at Stevens' Auction Rooms in March, 1905.

Besides the specimens mentioned above, a caterpillar, which subsequently died, was beaten from alder in the Exeter district in 1870; another was obtained from hazel in Gloucestershire, but this was "ichneumoned." Then there is a record of a moth or caterpillar, presumably the former, occurring in the neighbourhood of Paisley; and there is a report that a caterpillar was once found at the base of an aspen growing on Clapham Common. A specimen was taken at electric light at Bedford, May, 1907.

The caterpillar is green, with three reddish humps on the back, and an interrupted reddish line along the sides. It feeds on poplar in July and August.

The Large Dark Prominent (*Notodonta tritophus*)

Another Central European species, of which only one specimen is known to have occurred in Britain. This was reared from an egg, or from a caterpillar, obtained in Norfolk in the latter part of the summer of 1882. The moth might be mistaken for a small dark coloured specimen of the next species (*N. anceps*), but the dark hindwings readily distinguish it (Plate 31, Fig. 4).

The caterpillar, although darker, bears considerable resemblance to that of the Pebble Prominent; it feeds in June and July, and also in September, on aspen.

According to Staudinger this species is the *tritophus* of Esper, an earlier name than *torva*, Hübn.; whilst the preceding species, that has so long been referred to *tritophus*, Fabricius (or *trilophus*), is found to be *phœbe*, Siebert.

The Great Prominent (*Notodonta anceps*).

Fore wings greyish, or ochreous grey, with dark cross lines; a blackish tuft from middle of inner margin, and a series of dark, or sometimes reddish, spots on a pale cross line before the inner margin. Hind wings whitish, sometimes ochreous tinged; clouded with greyish on costal area (Plate 31, Fig. 5). When full grown the caterpillar is rather larger than the one figured on Plate 30. In colour it is green, with yellow lines along the back, seven reddish-edged yellow oblique streaks on the sides, and a reddish tinged stripe on the two rings nearest the head. It is stated to assume a purplish tint when quite mature. May be found from end of June to early August on oak. The dark reddish brown chrysalis, which is enclosed in an earth-covered cocoon, may be found at the roots of oak trees in the autumn or winter.

The moth emerges between late April and early June, sometimes remaining in the chrysalis for two winters. Light attracts it freely, and it is frequently seen in the illuminated moth trap, and may be occasionally noted on the iron frame of a gas lamp in suitable places. Sometimes the moth is met with in the daytime, resting on the trunks or branches of oak trees in woods, or on palings adjacent thereto. When such specimens happen to be females, they should be kept for eggs, which they lay freely.

It occurs in most of the southern counties of England, is somewhat rare in the Midlands, and scarce in the northern counties and in Scotland. Recorded by Birchall as "not uncommon in Co. Wicklow," but Kane ("Cat. Lep. Ireland") states that he has no information concerning its occurrence in the sister island. Distributed throughout Central Europe, extending into Spain, Italy, and Corsica; also to South-east Russia, Armenia, and possibly Ussuri.

The White Prominent (*Leucodonta bicoloria*).

The glossy white moth, prettily marked with orange and black, shown on Plate 33, was not known to inhabit the British Isles until 1858 when Bonchard obtained one specimen in a large birch wood in the Killarney district, Ireland; in the following year he took a second specimen. Both captures were made in the month of June. In June, 1861, one example of the moth was found in Burnt Wood, Staffordshire; and in the same wood, June, 1865, no fewer than six specimens were secured, and eggs obtained from one of the females. The caterpillars duly hatched out, but most of them were lost, only seven attaining the moth state. Kane states that in 1866 a specimen was taken in Mucross demesne, and caterpillars "were said also to have been beaten." Miss Vernon of Clontarf showed him her collection of insects from Kerry, and he found therein two rather poor specimens of the White Prominent from a new locality in Kerry. Barrett mentions the capture, in 1880, of a specimen near Exeter, Devonshire. More recently, however, several larvæ have been obtained near Kenmare and Killarney and the imagines bred.

The caterpillar, figured on Plate 32, from a coloured drawing by Mr. A. Sich, is pale yellowish green, rather whiter on the upper surface; the lines are green, the central one darkest; the stripe along the spiracles is yellow edged with green. It feeds on birch in July; and changes in due course to a dark reddish brown chrysalis, which is enclosed in a compact silken cocoon spun up between leaves. The moth emerges in May or June. Abroad the species seems to be generally distributed in Central Europe, and is also found in the Ural, Amurland, Ussuri, and Japan.

The Maple Prominent (*Lophopteryx cucullina*).

To Donovan and the entomologists of his time this moth (Plate 33, Fig. 4) was known by the English name still in use, Stephens considered it a rare insect, and remarks that he once caught a specimen at Darenth Wood, by "mothing," in June, 1820; several other examples had been taken in the same place, and in the neighbouring woods. Although many more localities are now known for the moth, it still continues to be rather a scarce species. It appears to inhabit woods on a chalky soil almost exclusively, and is found less uncommonly in the woods of Buckinghamshire than in its other haunts in Berkshire, Oxfordshire, Kent, Sussex, Devonshire, Essex, Cambridgeshire, Suffolk, and Norfolk. The bulk of the specimens in collections were probably reared from the egg, or from caterpillars obtained by beating or searching the maple bushes growing in the woods frequented by the moth.

The caterpillar is whitish green, rather glossy, with a dark green line along the middle of the back, which is broadest on the front rings, and a pale yellow stripe on the sides, the latter edged above with pale green; spiracles pinkish edged with black; a hump on the eleventh ring is purplish tinted. Head pale ochreous brown marked with reddish brown. Sometimes the general colour is yellowish or pinkish ochreous. May be found in June and July on maple (*Acer campestris*) and in confinement will feed very well on sycamore (*A. pseudoplatanus*). The moth usually emerges in May or June, but in 1901 Mr. Adkin reared ten moths, July 24 to 31, from eggs deposited in the spring of that year. The species does not seem to be a common one even abroad; its range extends through Central Europe to Italy and Sicily, and it is also found in Ussuri.

Pl. 30. *F* 76.

1, 1*a*, 1*b*. **Pebble Prominent**: *egg, caterpillar and chrysalis.*
2, 2*a*, 2*b*, 2*c*. **Iron Prominent**: *eggs, caterpillar, chrysalis and cocoon.*
3, 3*a*. **Great Prominent**: *caterpillar and chrysalis.*

Pl. 31. *F* 77.

1. Iron Prominent. 2. Pebble Prominent.
3. Three Humped Moth. 4. Large Dark Prominent.
5. Great Prominent.

The Coxcomb Prominent (*Lophopteryx capucina*).

Probably the commonest of the true Prominents, and certainly the most variable. The early stages are figured on Plate 32, and two forms of the moth on Plate 33. In its typical and southern form the fore wings are more or less pale reddish brown with a darker cloud on the inner marginal area; there are three dusky, or blackish, cross lines, but two of these are generally very indistinct, the third runs from the blackish "tooth" on the inner margin to the front edge of the wing, and is followed by a pale wavy band often outwardly bordered with dusky. Sometimes the fore wings are clouded with dark brown, and in the North of England a dark reddish form occurs. In Scotland the fore wings vary in colour from dusky brown through reddish to pale yellowish brown; sometimes the "tooth" is reddish in chestnut coloured specimens. The whitish eggs are laid on the undersides of the leaves of various trees and bushes upon which the caterpillar feeds; these are chiefly birch, oak, hazel, sallow, and beech.

The caterpillar, which appears in July to October, and sometimes even later, is green, with a darker line on the back, and a yellow one on the sides; two reddish tipped wart-like projections on the back of ring eleven. Occasionally the general colour is ochreous with a pinkish tinge, or it may be even purplish. There are two broods in the south of England, but only one in the north. The moths of the first brood fly in May and June, and those of the second in July and August, sometimes rather later. Pretty generally distributed throughout England and Wales, Ireland and Scotland. Abroad its range extends over Northern and Central Europe to Northern Spain, Northern and Central Italy, Dalmatia, Turkey, Armenia, Siberia, Amurland, Corea, and Japan.

The Scarce Prominent (*Odontosia carmelita*).

In 1828, when Stephens figured this moth, he only knew of two British specimens, both of which had been reared about sixteen years previously from caterpillars found at Darenth Wood. The wings, which are not thickly scaled, are purplish grey, becoming reddish brown on the front margins of the fore wings; the outer transverse line of the fore wings starts from a conspicuous creamy patch on the front margin, and the line on the hind wings is most distinct above the anal angle, where it runs through a purplish cloud (Plate 33, Fig. 5).

In April and May the pale blue eggs are laid on the underside of birch leaves. The caterpillar in June feeds on the foliage of the birch, and when full grown is green freckled with yellowish above; a darker line runs along the middle of the back, and a reddish spotted, or tinted, yellow stripe along the sides; the small head, also green, is marked with yellowish. When the chrysalids are kept indoors the moths emerge earlier than in the open, and it therefore sometimes happens that eggs are laid and the caterpillars hatch before the birch leaves are ready for them. In such cases I have got over the difficulty in a measure by removing a portion of the outer covering of one or two of the most forward buds to give the caterpillars a chance of getting at the unexposed leaves. The moth emerges in April or May, and, as pointed out by Mr. R. Adkin, it sometimes remains in the chrysalis for two winters. Possibly this species may be found in most districts where birch abounds; but, so far as its distribution in our islands is known, it certainly appears to be distinctly local. Besides Darenth, it also occurs in West Wickham Wood, and at Wateringbury, in Kent; the Weybridge district, Dorking, and Haslemere, in Surrey; Ashdown Forest, Blackdown Woods, Haywards Heath, and Tilgate Forest, in Sussex; New Forest; Hertfordshire; and Berkshire. There seems to be no record of

Pl. 32. *F* 78.

1, 1*a*, 1*b*. **Pale Prominent:** *egg, caterpillar and chrysalis.*
2, 2*a*. **White Prominent:** *caterpillar and chrysalis.*
3, 3*a*, 3*b*. **Coxcomb Prominent:** *egg, caterpillar and chrysalis.*
4. **Maple Prominent:** *chrysalis.* 5, 5*a*. **Scarce Prominent:** *chrysalis and cocoon.*

Pl. 33.

1. White Prominent.
4. Maple Prominent.
6. Pale Prominent.
2, 3. Coxcomb Prominent.
5. Scarce Prominent.
7. Plumed Prominent, *male*; 8, *female*.

the moth having been found in any other part of England, except Keswick and Windermere. In Scotland it has been reported from Galashiels, Clydesdale, the Tay district, Argyleshire, and Moray, and Ireland.

The Plumed Prominent (*Ptilophora plumigera*).

The thinly scaled fore wings are ochreous brown in the male, and purplish brown in the female, and the markings, which are most in evidence in the male, are yellowish. Hind wings, more sparsely scaled than the fore wings, are pale ochreous brown in the male and darker in the female. It varies in the tint of general colour and in the intensity of the yellowish markings. In the female the antennæ are simple, but in the male they are very plume-like, hence the English name. Buckler describes the caterpillar as whitish blue-green, with a broad deep green stripe down the middle of the back, and a narrow yellow line on each side of it ; spiracular line slender, white, and wavy ; head rather small, glossy, yellowish green. When quite full grown and mature it changes to a uniform semi-transparent green, like the underside of a leaf of maple, upon which, and also sycamore, the caterpillar feeds in May and early June. Maple bushes growing in hedgerows are usually selected by the female moths when laying their eggs. These are placed on the twigs near a bud, and may be searched for at any time from November until April. The moth is shown on Plate 33.

This species was figured by Stephens (1828) as *Ptilophora variegata* and the only locality then known to him was Darenth Wood, where, he states, the caterpillar was obtained almost every year. It still occurs in Kent and possibly in its old haunt ; it is also recorded from Watergate, Sussex ; South Devon (Torquay district) ; and Gloucestershire. In Bucks, Berks, and Oxfordshire it is more frequent than in any of the counties previously mentioned, and in all it seems to be found chiefly in chalky localities. The moth, which is on the wing in November

or sometimes in late October, has rarely been taken when flying at night or resting by day. Light has an attraction for the male, but apparently not for the female.

Distributed through Central Europe, its range extends to Southern Scandinavia, Northern Italy, Livonia, Bulgaria, S.E. Russia, and Japan.

The Pale Prominent (*Pterostoma palpina*).

This blackish streaked, pale brownish grey moth has been known as the Pale Prominent since 1775, when Moses Harris gave it this name. Beyond the black scaled tooth-like projection the inner margin is notched. The antennæ of the female are pectinated, but the teeth are shorter than those of the male ; and the blackish streak on the wings are usually less defined. Except that some specimens are more strongly marked than others there is little to note in the way of aberration. Mr. Harwood of Colchester has, however, recorded an almost black variety, and this may be referable to the form from Russian Lapland, known as var. *lapponica*, Teich. The moth is figured on Plate 33, and the early stages on Plate 32.

The caterpillar is bluish green, with white lines along the back and sides, and a black edged yellow stripe along the spiracles ; the stripe is marked with reddish on the three rings nearest the head. It feeds chiefly on poplar, but has been found on willow and sallow. Usually to be obtained full grown early in July or late in June ; in the south and south-east of England, it is found also in September and October. The chrysalis is purplish, or reddish, brown and rather shining. It may be found, in a cocoon formed of silk mixed with particles of earth, among the roots of grass, etc., at the foot of poplar or willow trees. Moths are on the wing in May and June, and again in July and August. Coming to electric and gas lamps, as well as entering lighted rooms, and illuminated moth traps, they are often

Pl. 34. *1 &c.*

1, 1*a*, 1*b*, 1*c*. **Chocolate Tip:** *egg, caterpillar, chrysalis and cocoon*

2, 2*a*, 2*b*. **Small Chocolate Tip:** *caterpillar, chrysalis, cocoon and larval retreat.*

Pl. 35. *G* 81.

1, 2. **Chocolate-tip Moth.** 3. **Buff-tip Moth.**

4. **Scarce Chocolate-tip,** *male* ; 5 *female*. 6. **Small Chocolate-tip,** *male* ; 7 *female*.

secured ; otherwise they are rarely seen in a state of nature. The species is most frequent, perhaps, in the southern countries, but seems to occur throughout England ; it becomes scarcer from the Midlands northwards to Durham and Cumberland. It occurs in Southern Scotland, and has been recorded from Moray. In Ireland it is widely distributed, but is not noted as common in any locality. The range abroad extends through temperate Europe into Asia Minor, and as far east as China and Japan.

FIG. 21.

Eggs of Buff-tip Moth.

The Buff-tip (*Phalera bucephala*).

This species (Plate 35, Fig. 3) is easily recognized by its violet-grey fore wings, and the more or less round, pale, ochreous blotch on the outer third. The blotch is clouded, to a greater or lesser extent, with pale brown, and the inner area of the wings is flecked with silvery grey; the cross lines are edged with reddish brown.

The rather downy caterpillar is yellow, with several interrupted blackish lines, and of these the one along the middle of the back is the broadest and blackest ; head black. It feeds, during August and September, in companies, until nearly full grown, and the foliage of almost any kind of tree or bush appears to be suitable food, although that of elm, lime, and hazel is often selected by the female moth when depositing her whitish eggs, which

she lays in neatly arranged batches on the undersides of the leaves. If undisturbed, a company of these caterpillars quickly clear a fair-sized branch of all leafage. The chrysalis is purplish brown (the early stages are shown on Plate 37).

The moth flies in June and July, but is rarely seen in the daytime. The wings in repose are closely folded down to the body and the insect has then a very stick-like appearance, and may thus easily escape detection.

Occurs throughout England and Wales, Ireland, and Scotland. It is most common, and the caterpillar often abundant, in London and its suburbs, as well as other southern parts of the country. Its range extends through Europe to Northern Asia Minor, Armenia, and Siberia.

The Chocolate-tip (*Clostera curtula*).

Two examples of this moth are shown on Plate 35. Fig. 2 represents the spring (April and May) form, and Fig. 1 the summer (July and August) form. Sometimes there is a third brood, in September or October, and Barrett describes the individuals of this as "pale drab, dusted with darker atoms, and with the chocolate blotch paler towards the apex." Hybrids have been obtained from a pairing between *curtula* female and *anachoreta* male, and these were most like the female parent. The early stages are figured on Plate 34, Figs. 1–1*c*.

The verdigris-green eggs are laid in batches on the leaves of poplar and aspen, upon which the caterpillars feed in May and June, and, as a second brood, in August and September. In colour the caterpillar, which is rather hairy, is grey, with a pinkish tinge, sprinkled with black, and with orange spots on the sides; there is a raised black spot on the fourth ring, and another on the eleventh; head blackish. The chrysalis is reddish-brown, spun up in a packet of leaves. This species appears to be less common in England than formerly. It is,

perhaps, more often observed in Kent and Sussex than in the other counties it inhabits, which, according to Barrett, are Berks, Essex, Suffolk, Norfolk, Cambridge, in all of which it is local; also, but more rarely, in Gloucestershire, Worcestershire, Herefordshire, Leicestershire, Yorkshire, and Cumberland, the latter county being its northern limit. To the above may be added Hertfordshire and Middlesex. Although caterpillars are reported to have been found in Ireland, the moth has not been reared in that country.

This species is distributed through Northern and Central Europe, extending to South France, Corsica, North Italy, Bulgaria, Armenia, and Mongolia.

The Scarce Chocolate-tip (*Clostera anachoreta*).

This moth is distinguished from that last referred to by the black spots in and just below the blotch at the tip of the fore wings; the blotch itself is dull reddish, merging outwardly into greyish, and is intersected by a white line. There is some variation in the tint of the general colour, ranging from dusky to reddish grey, but otherwise the species is constant (Plate 35, Figs. 4, 5).

The caterpillar, which feeds on poplar and sallow from May to August, or even later, is rather hairy, dark grey or blackish in colour; there are four ochreous or whitish lines on the back, and a row of black spots followed by a series of orange ones on the sides; below the spiracles are some yellowish markings; the raised spots on rings four and eleven are reddish brown; the former has a white spot on each side, and the back of the latter is edged with white; head black and rather glossy. Chrysalis blackish in hue, spun up among leaves. The moths emerge in May, and again in July; in confinement there is sometimes a third brood in September. Except that two

specimens were reported as found in a street at Deal, the moth does not seem to have been noticed at large.

This species was known to Haworth, but, as a British insect, was exceedingly rare until 1859, when Dr. Knaggs found some caterpillars upon poplar in the neighbourhood of Folkestone. From the stock then obtained the moths were reared in numbers for some time. Batches of eggs were also put down in various localities, and the species seems to have flourished in some of them for a while, but failed eventually to establish itself in any of them. Then the species disappeared from the Folkestone locality, although a caterpillar or two were found there in 1861, and on to 1912 in other places on the Kentish coast. In 1893 eggs were obtained at St. Leonard's, in Sussex, and thus originated a new stock.

The species has a wide range in Central and Northern Europe, extending to some of the southern parts ; it also occurs in Siberia, Amurland, China, and Japan.

The Small Chocolate-tip (*Clostera pigra*).

This species will be recognized by its smaller size and less distinct chocolate blotch on the tips of the fore wings. The ground colour varies from whitish grey to pale brownish grey ; the pale cross lines are usually well defined ; the first is bordered with chocolate colour, and angled above the middle ; the third line runs from a white spot on the costa and through the chocolate patch. The moth is shown on Plate 35, and the early stages on Plate 34.

Of the offspring resulting from eggs laid by a female *curtula* that had paired with a male *pigra*, and also those from a female *pigra* crossed with a male *curtula*, the hybrids in each case most nearly resembled the female parent.

The eggs are pale olive green tending to brownish, and all that I have seen have been laid in irregular lines on leaves, or

on the sides of a chip box. The caterpillar is greyish, with some short hairs and black dots ; the back is broadly marked with yellow, and there is a yellow stripe, with black dots on it, low down on the sides ; rings four and eleven have each a raised black spot ; head blackish. Feeds from June to September, on dwarf sallow (*Salix repens*), and also on young plants of aspen. Like other caterpillars of this genus, it hides by day in a packet of leaves spun together. There are certainly two broods, if not more, in the year. The moth emerges in May, and more irregularly in July or August, and October. Except when attracted to a light, the moth is rarely seen, but in fens, marshes, and boggy places generally, the caterpillars may often be obtained in numbers almost throughout the United Kingdom. Its distribution abroad embraces Northern and Central Europe, with extension into Northern Spain and Italy ; Bulgaria, South-east Russia, and Armenia.

THYATIRIDÆ.

The nine British species next to be considered belong to the old family Cymatophoridæ, but as the name *Cymatophora*, as indicated by Hübner in the "Tentamen" (1816), is now generically used by authors for some species of Geometridæ ; and as Hübner's *Verzeichniss* generic names will have to be used for the species previously included in *Cymatophora*, Tr., the term Thyatiridæ has here been adopted for this family—the Polyplocidæ of Meyrick and others.

The Buff Arches (*Habrosyne derasa*).

This pretty species (Plate 36, Figs. 1, 2) is well distributed over the greater part of England and not at all uncommon in the more sylvan districts of the southern counties. It occurs in Wales but has only once been recorded from Scotland. In

Ireland it is found in almost every well-wooded locality, but is not generally common. The moth hides among the foliage of the bramble and also creeps under the withered leaves on the ground. It comes freely to sugar, and is often the earliest to attend the banquet, but is rather skittish at first and should be given time to settle down.

The fore wings are pale olive grey with two whitish streaks across them, the first oblique approaching the second towards the inner margin ; the space between the streaks is clouded with brownish buff and there is a whitish cloud on the costal area, and some strongly waved cross lines before the second streak.

The caterpillar, which is rusty brown, with a blackish central line on the back, a black edged yellowish spot on ring four, a smaller one on ring five, and sometimes a tiny one on ring seven, feeds in August and September, sometimes later, on bramble, and is said to eat hawthorn and hazel. It hides during the day and comes up to feed at night. The chrysalis, which is enclosed in an earthen cocoon below the surface of the ground, or sometimes among moss, is purplish black with the ring divisions reddish ; the anal spike is furnished with hooks. As a rule the moth does not emerge until June or July following the year of pupation, but it has been found on the wing in September and October.

Distributed over Central Europe, extending into Southern France, and Northern Italy, Southern Sweden and Livonia, and eastward to the Himalayas, Corea, and Japan.

The Peach-Blossom (*Thyatira batis*).

The olive brown fore wings of this moth are adorned with five pink-tinged whitish spots, and clouded with brown ; the pink tinge varies in amount and in brightness, and sometimes gives place to pale ochreous. The moth is figured on Plate 36, and the early stages on Plate 37.

Pl. 36. *G* 86.

1. **Buff Arches Moth,** *male;* 2 *female.* 3. **Peach-blossom Moth,** *male;* 4 *female.*
5. **Figure of Eighty,** *male;* 6, *female.* 7. **Poplar Lutestring,** *male;* 8 *female.*

Pl. 37.

1, 1*a*. Buff-Tip : *eggs and caterpillar.*
2, 2*a*, 2*b*. Peach-Blossom : *eggs, caterpillar and chrysalis.*

The fluted greenish-white eggs are laid upon the edges of bramble-leaves.

The caterpillar is pale reddish brown shaded with darker and freckled with whitish (in the young stage the second and third rings are whitish above) ; a slender dark brown line along the middle of the back, and a broader one along the sides, the latter not distinct on the first three rings ; the two rings nearest the head each have a divided ridge, the second being the larger ; there are also similar ridges on the fifth to ninth rings, and the back of ring eleven is slightly raised ; a series of pale triangular marks on the back. It feeds on bramble in July, and may be found from that month until September.

In confinement it will thrive on raspberry or the cultivated kinds of blackberry. From some thirty eggs I had in June this year (1907) the caterpillars hatched on the 27th ; several of these fed up rapidly and one or two had spun up for pupation, among the leaves, in July (about 24th), whilst others remained quite small, and a few were in the last skin but one. Early in August the larger caterpillars just referred to pupated, and the smaller ones began to feed up, and by the end of the month they had attained to full growth, although they did not spin cocoons until the second week in September.

From July chrysalids moths will often emerge in August or September of the same year, but none have appeared from those under observation. The chrysalis is pale brown mottled with dark purplish or reddish brown, wing cases reddish. The species frequents woods or wooded localities, and is generally distributed throughout England and Wales, but commoner in some parts than others. Rather local in Scotland but not uncommon in Perthshire. Sometimes very abundant in Ireland, occurring in similar localities to the preceding species. It is found over the greater part of Northern and Central Europe, and as far east as Amurland and Japan.

The Figure of Eighty (*Tethea ocularis*).

This moth (Plate 36, Figs. 5, 6) may be distinguished by two whitish marks on the fore wings which have some resemblance to the numerals 80, hence the common name. These are really the white outlines of the reniform and orbicular stigmata, each of which has the central part filled in with black; sometimes the lower portion of the 8 is obscure, but in a general way the character is not difficult to make out.

The caterpillar is yellowish tinged with greyish on the back; a greyish plate on the back of the ring nearest the black marked orange head; three black spots on each side of the first ring, two such spots on ring two, and one on each side of rings three to eleven; the back of the last ring has a greyish plate. It feeds in July and August, earlier or later in accordance with season, on poplar. During the day it hides between united leaves, or in a curled up withered leaf, upon the tree. The shining black chrysalis with somewhat reddish ring divisions is enclosed in a rather loosely constructed cocoon spun up between leaves, or among moss etc., at the base of poplar trees. The moth emerges in May or June. It is partial to sugar, and is said to prefer its sweets served up on poplar trunks. Probably it is most often and regularly obtained in the Eastern Counties, but it is locally not uncommon in Worcestershire and Herefordshire; also found in Gloucestershire, Somerset, Hertfordshire, Middlesex, Surrey, and, I believe, Sussex. The range abroad is similar to that of *T. batis*.

The Poplar Lutestring (*Tethea or*).

May be recognized in the typical form by the four-lined bands, "lutestrings," on the greyish, sometimes pink-tinged fore wings; the reniform and orbicular marks are often present, although the first is generally obscure, and they never assume the similarity

to figures noted in the last species (Plate 36, Figs. 7, 8). In Scotland the moths have a paler ground colour generally, var. *scotica*, Tutt. ; one from Ireland with ground colour pearly white and broad black "lutestrings" has been named var. *gaelica*, Kane. Hybrids from a cross pairing of this species with the last have been obtained by Mr. W. H. B. Fletcher. These specimens have the "lutestrings" of *or*, and the "figure of 80" characteristic of *ocularis*. Caterpillar yellowish green with a dark line along the middle of the back, and two black spots on the front edge of the ring next the yellowish brown head. It feeds on poplar, and hides between united leaves in the daytime ; may be found from July to September or even later. Chrysalis, reddish brown, the surface minutely pitted, and spike pointed, and thickened at the base ; in a brownish cocoon spun up between leaves. The moth emerges in June or July, and it comes freely to sugar, but like other members of this family is not always easy to box. It seems to occur in most places where poplar trees are well established ; widely distributed over England, and found throughout Scotland even to the Shetland Isles. In Ireland it seems to be local and rare. Distribution abroad much as in the last species.

The Lesser Satin Moth (*Tethea duplaris*).

Figs. 1, 2, on Plate 39, represent the typical southern form of this species. The fore wings are pale greyish with a whitish edged, broad, dark central band ; two black dots on the outer edge of the band distinguish this species from the next. In Scotland and in Northern England the general colour is blackish or purplish grey (Fig. 3), and sometimes specimens more or less suffused with the darker colour are found in the southern half of England. Quite the darkest, almost black, form seems to occur in Cannock Chase, Staffordshire, and in Delamere Forest, Cheshire. The caterpillar is greenish ; central area of the back

green, margined on each side by an olive green, or brighter green, stripe ; some black dots along the sides ; head reddish brown marked with black. Feeds on birch, and may be found from August to October. It spins the leaves together for a shelter during the daytime, and comes out to feed at night, when it may be obtained by beating the boughs. Other food plants mentioned are alder, oak, and hazel. The pupa is of a dull reddish colour, in a slight cocoon between leaves.

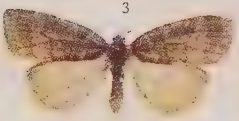
Widely distributed throughout England and common in most woodlands, especially in the south and east ; it ranges through Scotland to the Shetlands. In Ireland, where the moth has the ground colour silvery grey (var. *argentea*, Tutt.), it has been obtained in many localities, from Donegal and Tyrone to Kerry and Cork.

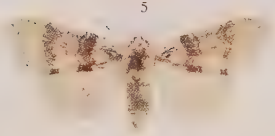
The Satin Carpet (*Tethea fluctuosa*).

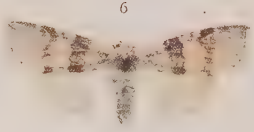
In colour and general pattern this species (Plate 39, Fig. 4) is very similar to the last in its typical form. The points of distinction are, the slightly larger size, whiter ground colour, and the absence of the two black dots from the edge of the band. In August and September the caterpillar feeds, at night, on birch, and by day conceals itself between leaves. It is reddish or violet grey above, and pale ochreous-white beneath ; the lines down the centre of the back and along the sides are darker ; on the first ring there is a greenish-tinged yellow plate, and from this to the eleventh ring there are two series of black dots along the back. Head yellow-brown, blackened above ; a black circle on each cheek. Chrysalis reddish-brown, in a cocoon among leaves either on the tree or on the ground. The moth emerges in June, and is distinctly local. Sometimes it may be disturbed from its resting place among the foliage ; it becomes active on the wing at dusk for a short time ; sugar does not seem to possess any great attraction for it, anyway it does not attend

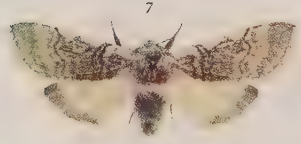
Pl. 38. *G* 90.

1. **Frosted Green :** *caterpillar.*
2, 2*a*, 2*b*, 2*c*. **Yellow Horned :** *egg, caterpillar, chrysalis and cocoon.*









Pl. 39. *G* 91.

1. **Lesser Satin Moth.** *male*; 2 *female*; 3 *northern var.* 4. **Satin Carpet Moth.**
5. **Lesser Lutestring,** *male*; 6 *female.* 7, 8. **Yellow-horned Moth.**
9. **Frosted Green Moth,** *male*; 10 *female.*

the feast very frequently, but it sometimes comes freely to a light. It is known to occur, chiefly in woods, in Kent, Surrey, Sussex, and Hampshire in the south; Essex and Suffolk in the east; also in Worcestershire (Wyre Forest), and Herefordshire; in the Barnsley and Sheffield districts of Yorkshire; and it has been reported from Cumberland. In Ireland it is rare but is recorded from Galway, Mayo, Kerry, and Sligo. Abroad it occurs in Central Europe, the range extending to Southern Scandinavia, and to South-east Russia.

The Lesser Lutestring (*Asphalia diluta*).

The fore wings are whitish or greyish, and sometimes tinged with brown; crossed by two brownish bands. Variation is chiefly in the tint of the bands and also in their width and definition. In var. *nubilata*, which occurs in Yorkshire, the general colour of the fore wings is darker than normal, and there is a basal patch and three cross-bands of reddish or purplish brown (Plate 39, Figs. 5, 6).

Caterpillar, yellowish above and greyish beneath; a dusky line along the middle of the back, and one, dotted with black, low down on the sides; head dark brown, almost blackish. It feeds in May and June on oak, but only at night; it constructs a leafy chamber in which it sits tight during the day, and is not easily evicted unless its apartment is forcibly opened. The reddish chrysalis is enclosed in a flimsy cocoon between, or among, leaves. Although September is the month during which the moth usually emerges, it is sometimes seen earlier. It is so partial to sugar, that it may often be seen at an old patch before the new feast has been set out for the evening entertainment. The species is fairly well distributed throughout England and Wales, and most common in the south of the former country. It extends into Southern Scotland, but

apparently does not occur in Ireland. Abroad it is found in Central Europe, Belgium, North Germany, North Italy, and North-east Asia Minor.

The Yellow Horned (*Achlya flavicornis*).

In the South of England this species is greenish grey, sometimes speckled or dusted with darker grey ; the reniform and orbicular marks are generally clear and distinct, but in some examples they are united and form a whitish blotch outlined in blackish ; the cross lines are usually well defined, but in the dark grey dusted form are very obscure. Specimens from Scotland are generally larger, there is less green, if any, in the ground colour, and the markings are often more pronounced and brighter. This form is the var. *scotica*, Tutt., and may be more or less identical with the var. *finmarchica*, Schöyen, from Norway and Lapland (Fig. 7, Plate 39, shows the English form, and Fig. 8 the Scotch form).

The caterpillar is greenish, light olive green, or dark olive green above, and yellowish beneath ; a line along the middle of the back is paler, and on each side there is a row of black spots and finely black-edged white dots ; a line above the brownish outlined spiracles is yellowish : the head is yellow brown with blackish jaws and black mark on each cheek. It feeds in June and July on birch, preferring the foliage of bushes. During the daytime it resides in a leaf neatly folded in half ; when quite young, the caterpillar then being blackish, a small leaf or just the turned-over edge of a large one answers its purpose. The chrysalis is reddish, enclosed in a flimsy cocoon among leaves, moss, or roots of grass, etc., sometimes just under the surface of the soil. The early stages are figured on Plate 38, Figs. 2–2*c*. The moth emerges in March or April of the year following pupation, as a rule, but it may remain in the chrysalis for two winters. It is often obtained in birch woods, or wherever there

is a good growth of birch, by jarring the twigs and branches of birch upon which it rests during the day, or it may be found by searching the low bushes and underwood. Soon after dusk it is on the wing, and will then visit sugar and sallow bloom.

Generally distributed throughout Great Britain. In Ireland it appears to be common. Its range abroad, in the typical form, extends over Northern and Central Europe to North Italy and to South-east Russia.

The Frosted Green (*Polyploca ridens*).

This moth (Plate 39, Figs. 9, 10) is also on the wing early in the year, but although it is sometimes found on tree trunks in April or perhaps as late as the first week in May, it seems to be rarely obtained otherwise in the perfect state. It does not "come to sugar" often, if at all, and so far as is known, does not visit any of the usual natural attractions.

The ground colour of the fore wings varies from whitish to green, but in some specimens the general hue is olive or blackish green, and the markings then appear to be wavy whitish lines crossing the wings, one near the base, and the other before the outer margin.

The caterpillar (Plate 38, Fig. 1) is yellow above and rather greenish beneath ; a greenish grey double stripe along the back is interrupted at the ring divisions ; there are also white dots with black or blackish edges on the back and the sides ; a yellow line along the spiracle area is shaded above and below with greenish grey ; the head, which is notched on the crown, is yellowish, with a black mark on each cheek. It feeds, at night, on oak, from May to July ; hiding by day on the underside of a leaf, a portion of which is folded over and secured with silk, to form a suitable retreat. These caterpillars respond more readily to the persuasive beating-stick than others of the group.

The species affects woodland localities in most of the southern

counties of England, and it is also found in South Wales. Its range extends into the Eastern Counties and through the Midlands northward to Cumberland. It does not seem to have been noted from Scotland or Ireland. Abroad it is distributed over Central Europe and northward to Denmark and Livonia, and southward to South France and Andalusia.

Tussock-moths (*Lymantriidæ*).

About seventy-two species, referred to this family, are known to occur in various parts of the Palæarctic region ; ten of these are found in our islands. The Black V-moth (*Leucoma v-nigrum* or *Arctornis l-album*) has been reported as British, but if the few examples that have been recorded were natives, the species has long since disappeared from this country.

Some of the caterpillars, as, for example, those of the Brown and Yellow-tails, are not altogether pleasant to handle, as the hairs with which they are covered have a disagreeable trick of transferring themselves to our hands, whence they find their way to our face, and when there are apt to set up most unpleasant irritation and swelling of the parts affected. These urticating hairs are more troublesome when received from the caterpillar or cocoon, but those from the moth itself communicate a very respectable simulation of the skin trouble known to the doctor as Urticaria.

The Scarce Vapourer (*Orgyia recens*).

The male of this species, and also of the next, flies in the sunshine, but the female of each is wingless, or nearly so, and has to remain at home on the cocoon from which she emerged. Here she lays a large number of eggs, from four to five hundred, upon the exterior. The eggs of this species are whitish and rather glossy when first laid ; the top is sunken. Apart from

the deeper brown colour of the fore wings and the blacker hind wings, the male of this species has a white mark near the tip of each fore wing, and this character will distinguish it from the same sex of the Common Vapourer.

The caterpillar is blackish with star-like tufts of hair, white on the back and greyish on the sides ; on rings four to seven are brushes of brown hairs ; a pencil of black hair on side of the first ring pointing forward, and a thicker one on the back of ring eleven directed backward ; the interrupted stripes along the back and sides are reddish orange, approaching vermilion ; those along the back are united in front of the pencil on ring eleven, and those of the sides unite behind the pencil. Head glossy, black. The foliage of sallow, willow, and oak, is perhaps the more usual food, but it has been known to eat beech, elm, hawthorn, sloe, and nut, and has been found on meadow-sweet. The chrysalis is brown, inclining to yellowish between the rings, and the back is hairy ; enclosed in a cocoon spun up among leaves or in any suitable cranny. The male and female moths are figured on Plate 40 (Fig. 3, 5), and the caterpillar and chrysalis on Plate 41.

The moths emerge in June, and from their eggs caterpillars result in July. These, feeding up quickly, attain the perfect state in late July or early August. Caterpillars from this second generation usually go into hibernation when quite small, and feed up in the following April and May ; in confinement they may, however, get through their metamorphosis and reach the moth state in September or October. Sometimes it happens that a part of the summer brood of caterpillars will feed up straight away and produce moths in August ; others, feeding and growing more slowly, assume the winged state in November ; whilst a third portion will remain small and go into hibernation.

This very local species used to be obtained in the Wimbledon district, but it has not been seen there for some years past.

Other localities for it are the Norfolk and Cambridge fens, Bewdley Forest in Shropshire, and Wyre Forest, Worcestershire ; it is also found in some parts of Devonshire, Suffolk, Essex, and Yorks. Its range abroad extends through Northern and Central Europe, southward to North Spain, Piedmont, and Corsica, and eastward to Amurland, Corea, and Japan.

The Vapourer (*Orgyia antiqua*).

The male has the wings rather more ample than the same sex of the last species, the colour is a more ochreous red and there is a large white spot at the lower angle of the fore wings, but no white mark at the tips of these wings. Specimens from the north of England are rather darker than southern examples. In the course of temperature experiments it has been noted that the colour of the moth is darkened if the chrysalids are put in a refrigerator for a few weeks, and then brought into a mean temperature of 40° Fahr. In the female the appendages representing wings are somewhat larger than those of the female of the Scarce Vapourer, but are quite useless as organs of flight (Plate 40, Figs. 4, 6).

In general colour the caterpillar is violet or smoky grey ; the markings on the back comprise a creamy, red-dotted line along the middle area, this is edged with black, and on each side of it is a series of raised red spots ; the broken line along the sides is yellowish, and the four brushes of hair on the back are yellow, sometimes merging into brown above ; the pencils of longer hairs are blackish on the ring nearest the head, and dark grey or brownish on the last ring. It may be found through the summer on the leaves of most trees and bushes. Chrysalis blackish, glossy, and rather hairy. The cocoons are spun up in the crevices of bark on tree trunks, or in the fork of a twig, under the eaves of an out-house or shed, on palings and fences, etc. The hairs of the caterpillar are mixed with the silk

Pl. 40. *G* 96.

1. **Dark Tussock Moth,** *male* ; 2 *female.* 3. **Scarce Vapourer,** *male* ; 5 *female.*
4. **Vapourer,** *male* , 6 *female.* 7. **Pale Tussock,** *male* ; 8 *female.*

Pl. 41.

H 97

1, 1*a*. **Scarce Vapourer:** *caterpillar and cocoon.*
2, 2*a*. **Common Vapourer:** *egg-batch on cocoon and enlarged egg.*
3, 3*a*, 3*b*, 3*c*. **Pale Tussock:** *egg, caterpillar, chrysalis and cocoon.*
4. **Dark Tussock:** *caterpillar*

of the cocoon ; the female lays her pale brownish eggs, which are minutely pitted and have a darker ring below the sunken top, on the outside of the cocoon, and there they remain through the winter.

Generally distributed throughout the United Kingdom, but not so common in Ireland as in England and Scotland. It is quite a Cockney insect, and is found in almost every part of the Metropolis where there are a few trees. Occurs practically over the whole of Europe, and in North-east Asia Minor, Armenia, Siberia, Amurland, and North America.

The Dark Tussock (*Dasychira fascelina*).

The figures of the sexes of this species on Plate 40 represent the dark grey form. Sometimes the forewings are whitish grey and occasionally slaty grey ; the cross lines may be stronger or fainter, and in some specimens are nearly absent ; the yellowish colour usually seen on the cross lines may be missing, or, on the other hand, other parts of the wings may be stippled with yellowish. Laying her eggs in batches, the female carefully covers them with dark brown hairs from the tuft at the end of her body.

The caterpillar (Plate 41, Fig. 4) is blackish, with star-like tufts of hairs, yellow, mixed with longer blackish ones towards the head and tail, brownish grey on the middle portion ; a brush of black hairs on rings four, five, and eleven, and of white hairs on six, seven, and eight. Head black. When full grown (Plate 42, Fig. 3) the hairs of the body are greyish, and those of the brushes on the back are black flanked with white. When disturbed it rolls in a ring. It feeds on hawthorn, and various species of *Salix*, also on broom and ling. It hibernates when still small, in a silken cocoon-like envelope which it spins in the fork of a branch, or among the twigs of a bush ; growth is completed in April or May, and the winged state attained in

June or July. Sometimes the young caterpillars have been found in their winter quarters about the middle of July, and this would seem to imply that they occasionally lie dormant for two winters; at least this would appear to be so in Scotland whence such individuals have been recorded, with the additional information that they did not eat through the summer and that one was still alive in the following March. The chrysalis is glossy black, and hairy (Plate 42, Fig. 3*a*).

This is chiefly a northern insect, occurring most commonly on the Cheshire, Lancashire, and Cumberland coast. It is more generally distributed in Scotland. It also occurs in Kent and Dorset. In Ireland three caterpillars were found by Mr. Kane in the Bog of Allen, and the species has also been recorded from Tullamore and Mullingar. Distribution: Northern and Central Europe, extending to the Altai.

The Pale Tussock (*Dasychira pudibunda*).

This moth is much commoner and more widely distributed in England than that last mentioned. The central area of the greyish white fore wings is subject to variation in width and also in tint; this latter may be darker or lighter than the example shown on Plate 40, and the cross lines are in some specimens black and very distinct. The colour of the female ranges from pale greyish white through various tones of grey, and the bands on the hind wings may be as well defined as in the male. Black males of the species have been recorded.

The hairy caterpillar is green or yellow, the former mottled with whitish and the latter with greenish; on rings 4 to 7 are thick brushes of yellow hairs, and on ring 11 there is a tuft of reddish hair; the back is marked with black between the brushes, and there are black spots on the sides of the hind rings. Sometimes the caterpillar is light or dark brownish and the brushes are then greyish, or tinged with pale reddish or

Pl. 42. *H* 98.

1, 1*a*. Yellow-tail : *caterpillars.*
2. Brown-tail : *caterpillar.*
3, 3*a*. Dark Tussock : *caterpillar and chrysalis.*

Pl. 43.

H 99.

1. **Brown-tail Moth,** *male ;* 2 *female.*
3. **Yellow-tail Moth** *female ;* 4, 5 *males.*
6. **White Satin Moth,** *female.*

blackish. Altogether it is a pretty creature, and as it is, or was previous to the modern "washing," common in hop gardens at picking time, it was christened the "hop dog." It may be found from July to September on the foliage of birch, hazel, oak, and many other trees, as well as on hop. The moth appears in May and June, and rests by day on herbage, especially on bracken in woods (see Fig. 6, p. 7); at night it comes readily to light, and specimens so obtained are often of the female sex.

It is most at home in the southern portion, but occurs throughout England and Wales, to Cumberland. Only doubtfully recorded from Scotland, but in Ireland it has occurred in Galway, Kerry, Waterford, Cork, and Wicklow.

Distribution: Central and Northern Europe eastward to North-east China and Japan.

The Brown-tail (*Euproctis chrysorrhœa*).

Although sometimes found in the East and West of England, and even in Yorkshire and Durham, this appears to be essentially a coast species in Britain, and confined at that to Kent and Sussex, the former especially. Even in these favoured localities where it is usually abundant, it is, however, not always in evidence. The moths sit about at the end of July and early August on leaves of hawthorn, sloe, sea-buckthorn (*Hippophaë rhamnoides*), and wild rose, generally on the underside. Near the females will be found batches of eggs, which are covered with "fur" from the anal tuft of the female. The caterpillars hatch out in August, and while still very small go into hibernation in a common nest. In the spring, when active again, they construct a new habitation, and another or perhaps two more before they are full grown, about June. The chrysalis is very dark, almost blackish-brown, with tufts of hair, and the fairly substantial brownish cocoon in which it is enclosed

is composed of silk and caterpillar hairs, and is spun up on the food-plant, often singly, but not infrequently, several are made up in a common silken covering.

The caterpillar is blackish with brownish warts, each bearing a tuft of brownish hairs; a row of tufts of white downy scales on each side of the back of rings four to eleven; the central line on the back is black, edged on each side by a red line of variable width from rings six to ten; a vermillion round spot on nine and ten. Head blackish.

The moth is shown on Plates 43, 45, and the caterpillar on Plate 42, Fig. 1.

Distribution, Central and South Europe to North-west Africa and Asia Minor.

In 1897 an appeal was made to British entomologists to refrain from taking many specimens of this species; while American entomologists were seeking power to compel local authorities to suppress the Brown-tail, which about that time was a new, and no doubt introduced, insect pest in the State of Massachusetts.

The Yellow-tail (*Euproctis similis*).

The male has usually only one black mark on the fore wings, but sometimes there are two, as seen in Fig. 5, Plate 43; more rarely there is a dot or two towards the tips of the wings. The habit of the moth is to sit upon the foliage of bushes and the branches of trees, where it might easily be passed over for a fluffy white feather; occasionally it may be found on palings or even iron railings. About dark it is on the wing, and light has then a great attraction for it. The caterpillar is black with black and grey hairs; a vermillion stripe down the middle of the back has a black central line, and is expanded on rings four, eleven, and twelve; along each side there are tufts of snowy white fluffy scales; the back of rings four,

five, and eleven is velvety black and slightly raised, especially on ring four. Head black and glossy.

The caterpillars hatch from the eggs, which are laid in batches, in August, hibernate, each in a silken case, and recommence feeding in the spring (Plate 42, Figs. 1, 1*a*). In May, when nearly full grown, they separate and are then common objects on hawthorn hedges in many districts. They also feed on the foliage of oak, beech, birch, sallow, rose, apple, pear, and other fruit trees. Sometimes a nearly fully mature caterpillar has been found in August, this has pupated and produced a moth the same year. The chrysalis is rather hairy and of a brownish colour; the cocoon is similar to that of the last species. In late June and through July the moth is generally common throughout the Southern part of England, and as far northwards as Lancashire and Yorkshire. It has seldom been seen in Scotland, and only recently in Ireland.

Distribution, Central and South-eastern Europe, extending to Amurland, China, Corea, and Japan

The Reed Tussock (*Lælia caenosa*).

This insect (Plate 45) was formerly abundant in some parts of fenland, and was first met with, as a British species, at Whittlesea Mere about 1819 or 1820. It was subsequently found in Yaxley and Burwell fens. Up to 1860 it continued to occur freely in all stages, but by 1865 larvæ at a shilling per dozen, the price at which they had been sold by the reed cutters, were no longer obtainable, and they became so scarce that in the year 1871 or thereabouts, only two caterpillars were seen. The species was at that time seemingly on the decline, but a year or two later a good many males were attracted by the rays of a powerful lamp that had been set up at Wicken. Then the moths became fewer and fewer

until at last, somewhere about 1880, even the lamps would not draw a single specimen, and soon it appeared probable that the last of the Reed Tussock had been seen in the fens, its only known habitat in Britain.

Caterpillar, dusky with a blackish stripe along the middle of the back ; the raised dots are ochreous grey with pale yellowish brown hairs arising from them ; there are four brushes of yellow hairs on the back, bunches of long hairs on the first ring extended over the brownish head, and a pencil of similar hairs on ring eleven directed backward. The food plants given are bur-reed (*Sparganium*), Stephens ; *Cladium mariscus*, Barrett, and reed (*Phragmites communis*). Stephens states that the caterpillar and the moth were found at the end of July and beginning of August, but other authorities give August to June for the caterpillar, and July for the moth. The caterpillar described above, and of which a figure is given on Plate 44, was obtained, together with eggs and cocoon, from Dr. Staudinger and Bang Haas, of Dresden. All are preserved examples.

Abroad this species is found in Northern Germany and France, Hungary, Bulgaria, Amurland, China, Corea, and Japan.

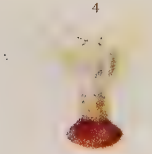
The White Satin Moth (*Leucoma salicis*).

The English name of this species dates back to about 1773, and is a very suitable one for it, the fore wings being especially glossy and satin-like. It seems to be less generally distributed over the country than formerly, but it is still common in most years, and in many places ; more particularly in the south of England, and on the Lancashire coast. Even yet it occurs in the suburbs of London, and on the southern side is sometimes not uncommon. In Scotland it appears to be rare ; Barrett mentions it from Aberdeen, Pitcaple, Inverurie, Peterhead, and Ayrshire. Kane states that in Ireland the species occurred near Ahascragh, and Donovan gives Lough Doon.

Pl. 44.

H 102

1, 1*a*, 1*b*. **Reed Tussock :** *egg, caterpillar and cocoon.*
2, 2*a*. **White Satin :** *caterpillar and chrysalis.*



Pl. 45.

H 103.

1. **Reed Tussock Moth,** *male ; 2 female.*
3, 4. **Brown-tail** *varieties.*

The caterpillar, which is hairy and variegated with reddish and black and white, may be recognised by the large bright white marks on the back. It is often seen in the daytime on the boles or branches of poplars, as well as on the foliage. It frequently falls a victim to the parasitical flies, and it is probably due to these enemies that the species is less common in some years than in others. Besides poplar, it will feed upon sallow and willow. Hibernating when quite tiny, it reappears in April, and, feeding up, is ready to enter the chrysalis state in June or July, when it spins a flimsy silken cocoon among the leaves, or in some suitable cranny on the tree or bush. The moth is shown on Plate 43, Fig. 6, and the caterpillar and chrysalis on Plate 44, Fig. 2, 2*a*.

The moth emerges in July or August, and may be found resting on or under the leaves, and on stems and branches of the trees upon which the caterpillar fed, or on palings, etc., adjacent thereto.

Distribution, Northern and Central Europe, Iberia, Corsica, Italy, Balkan Peninsula, South-east Russia, North-east Asia Minor, and Armenia. In the Far East, including China, Corea, and Japan, it is represented by the var. *candida*, Staud.

The Gipsy (*Lymantria dispar*).

Up to some sixty-five years ago, this species (Plate 46, Figs. 1 ♂, 2 ♀) seems to have flourished in a wild state in the fens of Norfolk and Cambridgeshire, and also in Huntingdonshire. Just how long it had been common in those localities history does not inform us, but about 1792 Donovan was unable to obtain a native specimen to figure. Stephens, however, writing in 1828 states that at that time it abounded in the Huntingdonshire fens. "It is said," he remarks "to have been introduced into Britain by eggs imported by Mr. Collinson, but the abundance with which it occurs near

Whittlesea, and the dissimilarity of the indigenous specimens (which are invariably paler, with stronger markings) to the foreigner, sufficiently refute that opinion." There appears to be no doubt that some time near 1840 the Gipsy moth began to decrease in numbers, and that about 1850 it had almost or quite ceased to exist, as a wildling, in England. At the present time, and probably since the date last mentioned, the species has been semi-domesticated, and so reared year by year, at first possibly direct from the original wild stock, but afterwards from fresh stock derived from eggs of foreign origin. Futile attempts have been made to re-establish the species in various parts of England, and also in Ireland. Such failure is curious, seeing that in America the accidental introduction of a few moths has resulted in the species becoming so numerous that at least one state has been expending thousands of dollars in endeavouring to destroy it. The eggs are laid in batches and covered with the down-like scales from the anal tuft of the female.

The caterpillar hatches in April, and in warm weather feeds up pretty quickly. It is grey, covered with black dots and fine marks; the hairs arising in spreading tufts from the raised warts, are longer on the sides than on the back; these warts on the back on each side of the pale central line are bluish on rings one to five, and reddish thence to eleven. Head, pale brown marked with black. Feeds on the foliage of most fruit trees, also on oak, elm, sallow, hawthorn, and sloe.

Chrysalis rather hairy, brownish in colour, in a fairly strong silken cocoon, which is spun up in any suitable angle.

The moths appear in August, and there is a striking difference in the size and coloration of the sexes. The male is pale or greyish brown, lined and clouded with darker brown on the fore wings, and the female is whitish with brownish cross lines, and a black central V-mark on the fore wings.

Distributed over the whole of the Palæarctic Region, except

the most northern, and, as adverted to, it has now become a pest in parts of North America.

The Black Arches (*Lymantria monacha*).

Two examples of each sex of this moth are figured on Plate 46, and these show the normal form of the species ; the central markings of the fore wings vary in width and intensity, and in some specimens the whole of the central area is more or less filled up with black or sooty black. Sometimes the wings are partially suffused with blackish, and the normal markings are consequently somewhat obscured. Examples wholly suffused with black are referable to var. *eremita*, a form not uncommon on the continent, and modifications of it are found in a wild state in this country. By selecting parents showing a tendency to vary in the direction of this dark form, it has been found possible to obtain a good percentage of darkened specimens, some of them closely approximating to var. *eremita*.

The early stages are figured on Plate 47.

The eggs of this species are laid in August in the chinks of bark on tree trunks, and do not hatch until the spring.

Caterpillar, whitish varying to greyish, a deep brown stripe along the middle of the back with an irregular black line on each side of it ; the stripe is interrupted by a whitish or greyish patch on rings seven to nine ; on ring two there is a black mark, and occasionally red dots appear on eight and nine ; black dots on the back and sides are furnished with hairs. Head, brownish marked with a paler tint. It feeds from April to July on the leaves of oak and various other trees, including apple and pine.

The chrysalis, which is enclosed in a somewhat transparent silken cocoon spun up in a fissure of the bark, is brownish, hairy, and has a very glossy metallic appearance.

The moth emerges at the end of July and in August. It flies

at night, and may be seen resting by day on the trunks of trees. Although it occurs in most of the counties of England from Yorkshire southwards, and in some parts of Wales, it is nowhere so often met with as in the New Forest. Scarce in Ireland.

Distribution, Central Europe extending to parts of Northern Europe, and southwards to North Italy and Greece, and eastwards to Ussuri and Japan.

Lackeys and Eggars (*Lasiocampidæ*).

Staudinger in his catalogue of Palæarctic Lepidoptera refers twenty genera comprising sixty-three species to this family. Of these, eleven species belonging to ten genera occur in the British Isles. According to some authorities a twelfth species, *Dendrolimus pini*, Linn., should be included. This is the *Eutricha pini* of Stephens (1828) and the "Wild Pine tree Lappet moth" and "Pine tree Lappet" of the more ancient authors. The claim of this species to a place in the British list rests chiefly on a specimen captured in the Norwich Hospital, in July, 1809, by Mr. Sparshall. Wilkes (1773) states that he once found a caterpillar near Richmond Park, but the moth was not reared. For generations the species now classified as Lasiocampidæ have been referred to Bombycidæ, but the silkworm (*Bombyx mori*) is typical of that family, which has but few genera in it, and none of them occur in Europe. Although some of the moths are of considerable size, most of them are not large. The general colour is some shade of brown. Both sexes have the antennæ bipectinated, but more strongly in the male than the female.

In his treatment of the species here included under Lasiocampidæ, Tutt ("A Natural History of the British Lepidoptera," vols. i., ii.) separates them into two families, Lachneidæ and Eutrichidæ. The first family is divided into five sub-families and the same number of tribes. The latter family has three

Pl. 46. *H* 106.

1. **Gipsy Moth,** *male ; 2 female.*
3, 4. **Black Arches,** *males ; 5, 6 females.*

Pl. 47

Black Arches Moth.

H 107.

Eggs, natural size and enlarged; caterpillars and chrysalids.

sub-families and three tribes. The whole are embraced in a super-family styled Lachneides. Lasiocampidæ disappéars as a family name, but the genus *Lasiocampa* is retained for *quercus*, L., whilst *trifolii*, Schiff., is referred to the genus *Pachygastria*, Hb., and these with *Aurivillia*, Tutt, not represented in Britain, constitute the Pachygastriidi tribe of the Pachygastriinæ, a sub-family of Lachneidæ. All this will no doubt appear very complicated to the beginner, but he need not worry himself very greatly about the matter at present. When he feels that he has a fair knowledge of the species in the group he will be in a position to grapple with the niceties of classification.

The Lackey (*Malacosoma neustria*).

The colour of the male ranges from pale yellow ochre, through pale brown to reddish or dark brown; and in the female from pale brown to reddish brown; two cross lines are generally present on the fore wings; the space between the lines is usually darker in the female, and sometimes in the male also, forming a dark central band. All these colour forms were reared from some caterpillars taken by myself at Byfleet, Surrey, in 1901. Another year a few caterpillars taken at Esher produced ochreous coloured males and pale brown females only; the bands of the latter were narrower than usual and much contracted below the middle. As the females last mentioned are somewhat under the normal size I am inclined to think that the caterpillars from which they were reared had been on short commons during their last stage. Two males and a female are shown on Plate 48.

The greyish brown eggs are laid during July and August in a ring cluster around a twig as shown on Plate 49, and so they remain exposed to all weathers during the winter. In April the caterpillars hatch out, and as they live in company throughout the greater part of their larval existence, the first business is to

construct a silken tent-like web (Fig. 22). The exterior of the tent affords a suitable surface upon which they can lie when they take a sun bath, which they seem fond of doing whenever the opportunity offers. It is also used, as well as the interior, for the process of skin-changing.

FIG. 22.
Web of Lackey Caterpillars.
(Photo by W. J. Lucas.)

The full-grown caterpillar is slaty blue above ; along the middle of the back is a bluish white line, bordered on each side by a reddish-orange-lined black stripe ; towards the lower limit of the slaty blue colour is a black edged reddish-orange line, and below this again the ground colour is flecked with orange, sometimes forming a line in the region of the spiracles ; there are two velvety black spots on the back of the ring nearest the head, and a smaller black spot on each side of the next two rings ; the hairs are brownish, rather more numerous on the sides than on the back. Head slaty-blue with two black eye-like spots. It feeds from April to June on hawthorn, sloe, and various fruit trees in orchards and gardens ; also on birch, elm, oak, sallow, willow, etc.

Chrysalis blackish, rather downy enclosed in a double

oval-shaped cocoon ; the inner compartment is of rather closer woven silk, and is thickly covered with a yellowish substance, which is ejected by the caterpillar as a fluid, and afterwards drying forms a sulphur-like powder on the cocoon, and in a lesser degree on the chrysalis also. The moth is on the wing in July and August, but it is rarely seen in the daytime, and not often at night, except when attracted by light into the house, or to the gas or electric lamps. It is exceedingly easy to rear, either from eggs or from collected caterpillars ; the latter are often abundant.

Generally distributed throughout England, but becoming scarcer from the Midlands to Lancashire and Yorkshire, and not often occurring further north than the last named county. In Ireland it is unknown in the north, but occurs in many parts of the south and south-west.

The Ground Lackey (*Malacosoma castrensis*).

This also is a variable species. Most frequently the fore wings of the male are pale buff, cross lined, and more or less clouded with brown ; hind wings brown. The female has all the wings reddish brown, the front pair being crossed by two pale buff lines. The fringes are pale buff, chequered with brown in both sexes. Colour and marking are, however, subject to considerable variation. Sometimes all the wings are pale buff (male), or reddish brown (both sexes), and the fore wings without marking. The cross lines on fore wings of the female may be either very slender or very broad ; occasionally almost the whole of the basal area up to, and including, the first cross line is buff. Two examples of each sex are shown on Plate 48.

The eggs are laid in a similar manner to those of the last species, around stems of wild carrot, sea wormwood, and other

plants that flourish in the insects' favourite haunts, which, in this country, are the salt marshes along the estuaries of the Thames and Medway.

The caterpillar is black, inclining to bluish between the rings; along the back are four much broken reddish orange lines and a central bluish line; a bluish stripe followed by a reddish one along the sides, and below this the colour is bluish, speckled with black; the hairs are golden brown. Head blackish grey, without black spots (Plate 49, Fig. 3).

The chrysalis and its cocoon are similar to those of the Lackey, and spun up among herbage.

The moth emerges in July and August and, although it may be occasionally attracted by light, is rarely seen in the open, The caterpillars are to be found, most years, in plenty from May to July. They feed on almost every kind of plant growing on the salterns, and as they are fond of sunning themselves on sea wormwood, sea plantain, etc., are easily seen at such times. In dull weather they retire to their webs, which are generally rather low down in the herbage. In confinement they will do very well if supplied with fresh sprays or leaves of almost any fruit tree, or of birch, whitethorn, etc. The receptacle containing them should be constructed and placed so that the caterpillars get plenty of air and sunshine. It is considered desirable to sprinkle both food and caterpillars with water now and then; some rearers deem it necessary to put a tiny pinch of salt in the water used for sprinkling; and in my own experience I have found that better results were obtained when the food was thus treated than when the salt was omitted.

On the continent this species occurs in woods, and on heaths, etc., but in Britain it is seemingly confined to salt marshes. Although it has been recorded from the Suffolk coast, and other places, the best localities for it are probably the salterns, from Gravesend to the Isle of Sheppey, and at Southend and Shoeburyness.

Pl. 48. *H* 110.

1, 2, 3. **Lackey Moth.**
4, 5. 6, 7. **Ground Lackey.**

Pl. 49. *H* III.

1, 1*a*, 1*b*, 1*c*. **Lackey:** *eggs, caterpillar, chrysalis and cocoon.*

2, 2*a*. **Hybrid between Lackey and Ground Lackey:** *eggs and caterpillar*

3. **Ground Lackey:** *caterpillar.*

Malacosoma hybr. *schaufussi*, Standf.—In 1884 Dr. Standfuss made some experiments in crossing three species of *Malacosoma*, and one of these was the pairing of *M. neustria* ♂ with *M. castrensis* ♀; the offspring he christened as above. Since that time others have succeeded in crossing the two species with varying results.

On August 13, 1906, Mr. Percy Richards sent me a small batch of eggs (Plate 49, Fig. 2*a*) laid by a female, *M. castrensis*, that emerged in a breeding cage, and had paired with a captured male, *M. neustria*, he introduced. The larvæ hatched out one or two at a time, from April 7 over a period of more than a fortnight. Few of the caterpillars would commence to feed, and of those that took to the plum and sallow with which they were supplied, only four reached maturity. Three of these pupated during late June and early July, and three moths, all females, have emerged up to date, one on July 28, another on August 6, and a third on August 13. The second specimen was very much crippled, probably owing to the cocoon having been accidentally injured. One caterpillar was still feeding on August 14, but died about the 26th.

The mature larva (Plate 49, Fig. 2) has the head and markings thereon like *neustria*, also the black spots on the first thoracic segment, but they are rather large and inclined to unite. The bluish line along the sides is dotted and freckled with black rather more thickly than in *castrensis*; the dorsal line is very thin, but bluish as in *castrensis*, and the red lines on each side of it are broad.

In colour the three moths are deeper brown than any form of either parent species that I have seen, but the transverse lines, and especially the outer, are most like those of *neustria*.

It should be mentioned that much information on Hybridism in the Lackey moths and other species will be found in Tutt's "British Lepidoptera," vol. ii.

The Pale Oak Eggar (*Trichiura cratægi*).

In its typical form the male of this species (Plate 50, Figs. 1, 2) is ashy grey, with a darker central band on the fore wings; and the female is dusky greyish-brown, also with a darker band. The colour of the male varies in shade from almost whitish (var. *pallida*, Tutt), to blackish grey; in the paler forms the central band of the fore wings is often of a purplish tint, and in the darkest forms the band is almost black. The female var. *pallida*, is pale buff.

The eggs, which are brownish, inclining to reddish on the micropylar area, are covered with dark grey hairs from the body of the female and laid side by side in a chain-like arrangement on a twig of hawthorn or sloe (those figured on Plate 51 were deposited in a box, and not securely attached). From eight to twelve is said to be the usual number in a batch, and each female will deposit an average of 160 eggs.

The caterpillars do not hatch out all at the same time, but by ones and twos, at intervals spreading over a period of two, or perhaps three, weeks. Several forms of the caterpillar have been described, but the ground colour is generally more or less black above and greyish on the sides; the ornamentation comprises interrupted white or whitish stripes, streaked or clouded with reddish, and reddish warts; the hairs are reddish brown. The example figured on Plate 51 was from eggs laid by a female moth in Selkirk, South Scotland. From the age of three weeks until it became full grown it was black marked with yellow on the back and orange on the sides; hairs pale greyish mixed with black ones, especially on the back towards the black, glossy, and somewhat hairy head. It hatched on April 26, was reared on plum, pupated early in June, and the moth, a darkish grey female, emerged on July 31. Another caterpillar that hatched on May 1, and two others from still later hatchings, were then in chrysalis.

The caterpillar may be found from April to June on hawthorn

Pl. 50.

H 112.

1. **Pale Oak Eggar,** *male ; 2 female.*
3. **December Moth,** *female ; 4 male.*
5. **Small Eggar,** *male ; 6 female.*

Pl. 51.

Pale Oak Eggar.
Eggs enlarged, and caterpillar

J 113.

and sloe, and it is said also on birch, oak, sallow, apple, bramble, etc. Those that I have found resting by day on shoots of hawthorn, apparently enjoying the sunshine, have almost invariably been "ichneumoned"; but others that came up after sunset to feed on the shoots were generally healthy. Usually the caterpillar feeds up and pupates the same year, but on the moors in Aberdeenshire and some other parts of Scotland it is said to hibernate and to complete its life cycle the following summer and autumn. Furthermore, the moths from these winter larvæ are much darker than normal, and have been doubtfully referred to var. *ariæ*, Hübn., a form found in the Alps, Scandinavia, and Finland.

The moth is out in August and September, and occurs in wooded districts throughout the southern half of England, but northwards from the Midlands it is uncommon; it is found in several parts of Scotland to Inverness. In Ireland it is reported (Birchall) to have occurred in Killarney, and Kane mentions that "a blackish form was taken at Magilligan, near Derry, by W. Salvage. Its larvæ were feeding on blackthorn." The range abroad extends through Europe to Armenia and Asia Minor.

The December Moth (*Pœcilocampa populi*).

This is a rather thinly scaled moth; the general coloration is sooty brown; the wings are suffused more or less with greyish; there are two pale ochreous cross lines on the fore wings, the first enclosing a reddish brown basal patch; hind wings rather paler with a diffuse whitish central band; fringes brown chequered with pale ochreous. Head brown, collar brownish, tipped with pale ochreous in the male. The female is rather larger than the male. The moth is figured on Plate 50, and the eggs and caterpillar on Plate 53.

The eggs, which are laid on the bark of trees, are whitish grey, variegated or mottled with darker grey.

The caterpillar hatches out in April, and when nearly full grown is ochreous, but so thickly dotted and freckled with black as to appear of a dark brown coloration; the back is clothed with dark short hairs, and the sides with long paler hairs; on the back of the first ring is a reddish brown mark divided by a white line; a double row of whitish dots along the back, most distinct on rings two and three, where they are placed on a velvety black bar; on each side of the white dots is a reddish brown interrupted line. Head ochreous brown, thickly dotted with black and clothed with pale hairs. Underparts ochreous, spotted and lined with blackish. Feeds on the foliage of most trees, and is said to eat lettuce. April to June.

Chrysalis glossy red brown, in a cocoon spun up among dead leaves, etc., under loose bark, or on the ground.

The moth does not emerge until October, and in that month, but more frequently in November and December, the males may be seen around gas lamps quite late at night.

Although found chiefly in woods it is not essentially a woodland species, as it occurs in districts where there are no woods but plenty of trees growing in parks, fields, or even hedgerows. It is fairly common generally throughout England and Wales, but becoming rather more local northwards to Cumberland. It occurs through Scotland to Sutherland, but is nowhere common. In Ireland it is widely distributed, and not uncommon near Dublin, and at Favour Royal, Tyrone. Abroad it ranges through Northern and Central Europe.

The Small Eggar (*Eriogaster lanestris*).

Also a brownish insect with somewhat thinly-scaled wings. The fore wings are light reddish brown with a whitish patch at the base, a white spot about the centre, and a whitish transverse line beyond; the hind wings are smoky brown and have a pale central band. The female, which is larger than the male, has a

Pl. 52.

Oak Eggar Moth.

I 114.

Pl. 53.

1, 1*a*. **December Moth**: *eggs and caterpillar.*
2 2*a*. **Small Eggar**: *eggs and caterpillar.*

conspicuous greyish anal tuft, the hairs from which she uses to cover over her pale oily green eggs when they are deposited in clusters on twigs of hawthorn or sloe in February or March. Plate 50, Figs. 5, 6; Plate 53, Figs. 2, 2*a*.

The caterpillar is black or greyish black, with reddish brown hairs, and a series of black-edged yellowish brown, or reddish brown blotches on each side of the back; these blotches are outlined in pale yellowish and occasionally connected by a line of the same colour. From the time they are hatched until nearly mature the caterpillars live in companies on a closely woven web of silk on a branch of hawthorn or sloe, only leaving their habitation to feed. These webs may often be seen on hedgerows from May to July. The brown chrysalis is enclosed in a solid-looking oval cocoon of a pale ochreous or whitish colour. Not all the moths emerge the following year: some will remain in the chrysalis over two or three winters, and occasionally they have been known to emerge seven years after pupation. The moth is said to be fully formed within the chrysalis all the time, but for some reason will not emerge, although if extracted from its shell, the moth has been known to expand its wings in the ordinary way. Barrett states that in the middle of February, after a moth had emerged, he "put a large number of cocoons upon a warm mantelpiece and obtained scores of moths within a few hours."

Generally distributed over the southern half of England; plentiful in some years in the Southern and Eastern Counties. Northwards and in Scotland it is local and less frequent. Kane states that in Ireland it is very locally abundant. The range abroad is through Central and Northern Europe to Southern Lapland, and eastward to Siberia and Amurland.

The Oak Eggar (*Lasiocampa quercus*).

The three moths, one male and two females, shown on Plate 52, were reared from caterpillars obtained in Kent, and they

represent the more or less ordinary South English forms of the species. Sometimes the ground colour of the male is more distinctly reddish, or rust tinted, and the yellowish bands narrower on all the wings. Or the bands may be much broader than in the male figured, and the widening is effected by extension in the form of rays towards the outer margins of the wings. A form that has been referred to, in error, as var. *roboris*, Shrank (= *marginata*, Tutt), has the outer margins of all the wings broadly yellow. I have not seen an English example of this form, but I have a reddish specimen in which the yellow band on the fore wings is broader than usual, and the whole of the outer third of the hind wings yellow, with a slight brownish shade on the external margin; this is *semimarginata*, Tutt, and is also identical with var. *roboris* of other British authors. The white spot usually present on the fore wings varies somewhat in size and shape; it is often seen on the under as well as the upper surface of the wings, except in the lighter coloured forms.

Var. *callunæ* (The Northern Eggar), is shown on Plate 54. The chief features of this form are the generally darker coloration in both sexes, the yellow patch at the base of the fore wings of the male, and the outward turn of the lower ends of the yellow bands. All these characters are subject to modification; the yellow bands may be very narrow at one extreme, or greatly widened at the other, and the hind wings may occasionally be bandless; the basal patch is often of large size, but in some examples it is entirely absent. Sometimes the bands are greenish in colour (var. *olivaceo-fasciata*, Cockerell), and more rarely, perhaps, the greenish tinge extends over the whole of the wings (ab-*olivacea*, Tutt). It should be noted here that the var. *olivaceo-fasciata* has occurred once or twice in South England, but this phase of aberration seems to be more connected with *callunæ* than with *quercus*.

Callunæ was not recognized as British until the year 1847, when it was introduced as a species distinct from *quercus*. The

Pl. 54. **Northern Eggar.** *I* 116.

Pl. 55.

Oak Eggar.

Egg, natural size and enlarged; caterpillars and cocoon.

I 117.

late Richard Weaver, who gave it the English name of the "Scotch Eggar," took specimens of the moth at Rannoch in 1845, and he found caterpillars in that year, as well as in 1844 and 1846. It is now well known to occur not only in Scotland, including the Hebrides and Orkneys, but also on the moors of Northern England, and in Ireland and Wales. In North Devonshire it is found not uncommonly in the Exmoor district, and it has been recorded from various parts of the New Forest in Hants.

The egg of *callunæ* is figured on Plate 55. It appears rather polished, and in colour is pale brown mottled with darker brown. The eggs are stated to be deposited whilst the female is on the wing, and consequently they fall to the ground or are arrested in their descent by the herbage over which they are scattered.

The full-grown caterpillar of *quercus*, beneath the brownish fur with which the body is clothed, is dark brown on the back and rather violet brown on the sides; the ring divisions are velvety black; there is a white stripe along each side and below the stripe some reddish marks; the ring nearest the head is edged with reddish, and the next two rings each have two reddish centred white spots. The dull purplish brown chrysalis is enclosed in a hard oval-shaped cocoon which is spun up on or near the ground in a flimsy web among herbage, dead leaves, etc. Sometimes it is placed among the twigs of the food plant.

In Southern England the caterpillars hatch from the egg in August and usually hibernate when quite small. They feed up during the following spring and early summer, perhaps in June or July, and the moth appears in July or August. Occasionally, however, a few individuals depart from the general habit and complete their growth the same year, hibernate in the pupal stage, and produce moths the next year, possibly earlier than hibernating caterpillars. On the other hand, perhaps owing to adverse weather conditions, feeding after hibernation may be continued well on into the autumn, when the caterpillars pupate,

but emergence of the moth is postponed until the following year, the second after hatching from the egg.

In the case of *callunæ*, at least as regards its normal habit in Scotland and southwards to the moorland districts of Yorkshire and Lancashire, the young caterpillar hibernates the first winter, feeds through the following summer, and passes the second winter as a chrysalis, the moth emerging in the following May or June.

Generally speaking, then, it may be stated that *quercus* has a twelve-month life cycle, whilst that of *callunæ* extends almost or quite to twenty-four months, of which at least twelve months are passed as a caterpillar. However, as has been noted, *quercus* sometimes passes one winter as a caterpillar, and another as a chrysalis, thus assuming the *callunæ* habit; whilst *callunæ* occasionally attains the perfect state during the summer following that in which the caterpillar left the egg.

The food plants comprise bramble, dogwood, hawthorn, heather (*Calluna*), and various low plants; it is even content with ivy.

Newman, in the *Entomologist* for 1845, gives a life history of the Northern Eggar (*callunæ*), and from this the following details are extracted. The male flies rapidly over the heather by day at the latter end of May or beginning of June; its flight is jerking or zigzag, and its object is evidently to find the female, who rarely moves until impregnation has taken place. Subsequently the female flies over the heather, dropping her eggs at random as she flies, and the eggs, having no glutinous covering, do not adhere to any object which they may accidentally touch in falling. On emergence from the egg the young caterpillar is dark ash coloured, the divisions between the rings of the body being indicated by two minute orange streaks, each of which is accompanied by a small black spot. After the first moult the ground colour becomes more smoky, the divisions velvety black, and on each ring a triangular orange spot appears;

Pl. 56. **Grass Eggar Moth.** *I* 118.

Pl. 57. *I* 119.

Grass Eggar.

Eggs, natural size and enlarged; caterpillar

these markings become more conspicuous later on, and by the end of October, when it hibernates, they are very distinct. It rests in a straight position, and, if disturbed, falls off its food plant, and rolls in a ring with its head slightly on one side.

The habits of the Oak Eggar moths (*quercus*) are pretty much the same as those of the Northern form, except that the moths fly in July and August, and frequent hedgerows, the borders of woods, heathy commons, and cliffs and sand dunes at the seaside.

A bred female of either form will attract numerous males, and even the receptacle in which a newly emerged female has been placed is almost as effective as the lady herself. When staying at a cottage on the edge of a moor near Lynton, North Devon, some years ago, I had some pupæ of the Oak Eggar. One day, late in July, quite a number of males entered the cottage and made their way to the cage in which the pupæ were, and I had no difficulty in boxing several of them. The next day I put the female moth, which had emerged the previous day, into a roomy chip box, and carried it in a satchel to the moor, where it was placed on the ground, the males began to arrive soon afterwards and some fine examples were secured. Although the female was taken on the moor only on the one occasion, that satchel continued to be an object of interest to the male Eggars for several days afterwards.

Generally distributed, and often common in some localities, throughout the British Isles. Abroad, its range extends over Europe into Asia Minor, Armenia, and Siberia.

The Grass Eggar (*Lasiocampa trifolii*).

This moth is usually brown in colour. The fore wings are inclined to dark rĕddish brown, and have a pale ochreous brown curved band or ring at the base, a slightly curved line or band of the same colour beyond the middle of the wing ; central spot

white, finely margined in black. Except that the female is generally larger, and the cross lines usually less distinct, the sexes are much alike. This brown form occurs most frequently in Britain, but in parts of the Kentish and Sussex coast, and especially the Romney Marsh district, a yellowish form is obtained. In such specimens the cross lines are darker. In both forms one or both cross markings may be faint or quite absent, and even the white central dot, which varies in size and shape, may be missing. Sometimes the outer band is distinctly broad and outwardly diffuse (Plate 56).

The eggs, which appear to be laid loosely, are pale whitish brown, roughened with darker brown, and the micropylar area is purplish brown. Some that I received on March 2, 1907, appeared to be on the point of hatching on the 5th of that month, but no larva came out, although one of the eggs was chipped at one end. It has been frequently stated that the caterpillars hatch out in the autumn and hibernate, but as has been pointed out by Tutt ("Nat. Hist. Brit. Lep.," ii. 20), the eggs of this species probably do not hatch until some time during February or March, although when kept indoors the caterpillar has emerged from the egg in January.

The full-grown caterpillar is black, velvety between the rings, covered with golden brown hair on the back and greyer hair on the sides, among which are some black ones ; three interrupted whitish lines on the back ; some of the hairs along the middle of the back stand erect and form a ridge, looked at from either end. Head lightish brown in colour, lined with black. Feeds in the spring months and up to June chiefly on various kinds of grass. Among many of the plants that it has been known to eat are trefoils, bird's-foot (*Ornithopus*), sea thrift (*Statice*), heather, sallow, hawthorn, sloe, plum, bramble, etc. With regard to the food, it is interesting to note that although one rearer will find that sallow is excellent for the caterpillars, another considers that sallow or hawthorn are but poor

substitutes for kidney-vetch (*Anthyllis vulneraria*) upon which the caterpillars were feeding when found (Plate 57).

The brownish chrysalis is enclosed in a hard but somewhat brittle, brown, oval cocoon, and when spun upon the surface of the ground, protected by an outside covering of loose silk webbing. In August and early September the moths appear. Emergence from the chrysalis usually takes place soon after midday; the males are early on the wing, and when reared in captivity they should be secured as soon as the wings are dry, or they may spoil themselves in their efforts to escape. Reared females are apt to be deformed, but for "assembling" they may probably be as useful as more perfect examples if the rearer happens to be able to exhibit the attraction in a locality for the species. Both sexes have been taken at electric light.

The best known localities for the species in England are, besides those already mentioned, the sand-hills on the Cheshire and Lancashire coast. It is, or has been, found also on the coast of Cumberland; Lyndhurst and Ringwood, in Hampshire; Isle of Purbeck, Poole, Swanage, and Bloxworth, in Dorsetshire; Devonport, Bolt Head, and Salcombe, in Devonshire; and Penzance and the Scilly Isles. Its range extends through Central and Southern Europe to Asia Minor and North Africa.

The Fox Moth (*Macrothylacia rubi*).

The male is reddish brown, and the female generally greyish brown, but sometimes is of a reddish grey coloration; the fore wings in both sexes are crossed by two pale ochreous lines on the central area (Plate 59).

The ground colour in the male ranges in tone from foxy red to dullish red brown or to greyish red brown. The cross lines in either sex may be widely apart, near together, or even united throughout their length, forming a band (var. *fasciata*, Tutt); sometimes one of the lines (var. *unilinea*, Tutt), or both lines, are absent from the fore wings, or from one of them.

The brown clouded greyish eggs are laid in batches, during June, on stems and stalks of plants, or on heather; sometimes they have been found on a fence, a rock, or a stone. The caterpillars hatch out at the end of June and through July. At first they are black, including the glossy head, and covered with long hairs which are black with some white ones amongst them; the ring divisions are pale yellow; later on they are more chocolate brown with yellow bands which, however, do not encircle the body entirely.

When full grown, in the autumn, the caterpillar is velvety black, and above this colour is most in evidence between the rings; the back is clothed with dense, short, bright reddish brown or tawny hair, and the whole body is covered with brownish hairs, varying in length, but always much longer than the tawny ones; along each side are some whitish hairs. Head blackish covered with brownish hairs. It feeds in August and onwards to October, when it seeks winter quarters, reappearing in the following spring, but not feeding again. After enjoying the sunshine whenever the opportunity offers through the early months of the year, it finally pupates in March or April. The cocoon is a long, more or less tubular, brownish construction of silk and larval hairs. It is spun up, usually somewhat upright, low down among the food plant, or at the roots of grass, etc.; sometimes among moss, when the rounded head end can just be seen above the moss (Plate 58).

In certain localities and seasons the caterpillars have been seen in enormous numbers, but such profusion only happens now and then. In some districts they may be abundant one year, and then scarce or quite absent for several years.

When handling the larvæ it will often be noted that the tips of one's fingers are thickly felted with the tawny hairs from the creature's back; if these hairs get transferred to the face or neck considerable irritation may be the result.

The late Mr. Robson used to collect the caterpillars on fine

Pl. 58. **Fox Moth**: *caterpillars* *I* 122.

Pl. 59.

1, 2. **Fox Moth,** *males ;* 3 *female.*

I 123.

days in early spring, put each caterpillar into a separate paper box about two inches square, and keep them on a shelf over the kitchen fire, where they would duly pupate. Various methods for keeping these caterpillars through the winter have been described, and all appear to have been fairly successful. The most simple would seem to be the following : Bore a number of holes in the bottom of a roomy box, and fasten wire gauze on a close fitting frame to serve as a top. Cut a tuft or two of heather to cover the floor space of the box. Caterpillars collected in the autumn may be put into this receptacle and supplied with food, such as bramble or sallow, as long as they seem inclined to feed. Do not crowd too many into the box, and let it stand out in the garden, preferably on the soil.

The moths emerge in May or June. The males are very active on the wing in the afternoon sunshine, and later on, and may often be seen in numbers dashing hither and thither in an apparently erratic flight over heaths and open spaces, in search of the females. The latter do not fly till night, and occasionally they are attracted to a bright light.

Except that it has not been noted in the Shetlands, the species occurs throughout the British Isles. Abroad its range extends over Europe, and it is found in Amurland.

The Drinker (*Philudoria potatoria*).

The male is reddish brown, more or less clouded on the fore-wings with ochreous ; and the female is yellow, or whitish ochreous. Sometimes this colour distinction of the sexes is reversed, and the males are pale whilst the females are dark. In the fens of Cambridgeshire notably, pale or yellowish males are not altogether uncommon. Such specimens would seem to accord better with the Linnean type than the more usual form indicated above. Barrett mentions, among other aberrations, male specimens from South Wales with the whole of the fore and hind wings deep rich glossy purplish chocolate.

There is variation in the two whitish or silvery marks on the fore wings, the upper one is often very small, sometimes quite absent, and the lower one reduced to a crescent. The chocolate brown cross lines, of which there are usually two on the fore wings, are sometimes faint or entirely missing. Tutt has recently named nine forms, chiefly colour aberrations, and two others were previously named. (The moth is figured on Plate 61, and the early stages on Plate 60.)

The eggs, which are white with bluish grey markings, are laid in clusters on grass stems, etc.

The caterpillar is slaty grey inclining to blackish ; the lines on the back are formed of yellowish dots and dashes ; two rows of tufts of short black hairs on the back, with longer brown hairs between ; low down on the sides are shaggy tufts of white and yellowish hairs and longer brown hairs ; an erect pointed tuft of brown hair on second ring, and a similar one on ring eleven but the latter inclines backward. Head greyish, striped and lined with brown and yellowish brown, and clothed with brown hair. It feeds on coarse grasses, including the ribbon grass grown in gardens, in August to September or October.

In the latter month it goes into hibernation, being then but little over an inch in length. About April it resumes feeding and becomes full grown in June or thereabouts. The long yellowish or whitish brown cocoon in which it changes to a brown chrysalis is more or less pointed at the lower end, and generally attached to a culm of grass or a reed. A showery season seems to suit these caterpillars better than a hot, dry one. The partiality of the caterpillar for a drop of dew, mountain or otherwise, has frequently been noted. The old English name of The Drinker Caterpillar (1682) is therefore not only an appropriate one but shows that this larval habit was observed even at that early date. The specific name *potatoria* given to the moth by Linné is of similar significance.

The moth emerges in July. It seems most addicted to damp

Pl. 60

I 124

Drinker Moth.

Eggs, natural size and enlarged; caterpillars and cocoon.

Pl. 61.

Drinker Moth.

I 125.

grassy lanes, ditch-sides, fens, marshes, moorlands, and sand-hills; and is not really uncommon in very many suitable districts throughout the United Kingdom. Abroad, it is common over the greater part of Europe and its range extends to Amurland and Japan.

The Small Lappet (*Epicnaptera ilicifolia*).

This exceedingly local and rare British moth has the fore wings pale reddish-brown, suffused on the outer marginal area with grey; about the centre of the wings there is a short black line preceded by a whitish mark; beyond is a blackish, indistinct, wavy line; the greyish outer area is limited by a brown line, and this is inwardly edged with whitish: hind wings purplish brown with the central area whitish and crossed by a blackish line. Fringes whitish, marked with brown at the ends of the veins (Plate 63).

Kirby states that the caterpillar is rust coloured, with a black stripe on the back, on which stand white dots; and with reddish-yellow transverse spots on the second and third rings. Another form is grey, and the back white, with a broad black central stripe interrupted by rust-coloured spots dotted with black.

The following brief description is taken from an inflated skin of an immature caterpillar received from Dresden: brownish inclining to reddish, paler between the rings; clothed with short greyish hair, and longer hairs from and above the fleshy tubercles low down along the sides; there is a hair-clothed eminence on ring eleven. The only conspicuous markings are on rings two and three; each of these has two orange spots separated and narrowly edged externally with velvety black; there are two small black spots on the back of each of the other rings, and indications of reddish circles around some of these. Head blackish, covered with greyish hairs (Plate 62).

In this country the caterpillar feeds on bilberry (*Vaccinium myrtillus*), but on the Continent it is said to eat the foliage of sallows and willows, also of birch.

The cocoon is spun up among the leaves of the food plant. That figured on Plate 62, of foreign origin, was on a shoot of bilberry; a moth emerged from it on April 5, 1907. The first detailed account of this species in Britain is that in the *Zoologist* for 1852, in which Mr. Atkinson records that he took a specimen in May, 1851, at Cannock Chase in Staffordshire. A year earlier two larvæ were found by Mr. Green on a moor near Sheffield, and one of these attained the moth state in April, 1851. After this moths and caterpillars seem to have been taken in varying numbers down to 1896, when a specimen was captured by Dr. R. Freer of Rugby. Tutt, quoting from a letter received from Dr. Freer, states that two moths were reared from three caterpillars found at Cannock in 1898. The only other known British locality is in the neighbourhood of Lynton, North Devon, where a caterpillar, which, from the description, must have been this species, was found in 1864. It was taken on August 3 in a wood abounding with bilberry.

The species ranges over Central Europe, but seems to be generally rare; it also occurs in Amurland and Japan.

The Lappet (*Gastropacha quercifolia*).

Warm reddish brown is the prevailing colour of this fine moth. The wings are more or less suffused with purplish grey, and crossed by blackish lines—three on the fore wings and two on the hind wings. Except in the reddish tinge, which may be bright or dull approaching chocolate, this species is pretty constant in its coloration. Barrett mentions a specimen of a light brown colour, and another of a pale buff. The first of these forms seems to approach the var. *meridionalis*, Staudinger (Tutt), and the other to var. *ulmifolia*, Heuäcker, which are

Pl. 62. *I* 126

1, 1*a*. **Lappet Moth:** *eggs, natural size and enlarged; caterpillar.*
2, 2*a*. **Small Lappet:** *caterpillar and cocoon.*

Pl. 63.

1. **Small Lappet Moth**, *male ;* 2 *female.*
3. **Lappet Moth**, *male ;* 4 *female.*

I 127.

well known on the Continent. In certain favourable seasons a second generation of the moth has been obtained, chiefly perhaps, in confinement, and on the Continent; although in Britain a caterpillar or two will sometimes feed up and attain the perfect state the same year they hatch from the egg. These examples, which are much smaller, but do not otherwise differ from normal specimens, are referable to var. *hoegei*, Heuäcker.

The moth is figured on Plate 63, and the eggs and caterpillar on Plate 62.

The eggs, which are whitish in colour with greyish markings, are laid, in July or early August, in twos, threes, or more, on twigs or the undersides of leaves of sloe, apple, sallow, hawthorn, etc. A single female moth has been known to lay over a thousand eggs, but this is perhaps exceptional, and somewhere about half that number is possibly near the average. Even the latter would take the moth some time to distribute here and there in small batches.

The caterpillars hatch out in about a fortnight, feed for a few weeks, and in the autumn, when about three-quarters to one inch in length, take up their winter quarters low down on the stems of the food plant, but, in confinement, often on a withered leaf.

Caterpillar dark grey, so thickly sprinkled with minute black dots as to appear almost black; the whole body is clothed with fine and rather short blackish hair; low down on the side there is a fringe of brownish hair, and this covers the fleshy lappets (the older writers named this larva the "Caterpillar with the Lappets"); two white marks edged in front with black on the third ring, and a hairy prominence on the eleventh, are the most conspicuous features of this caterpillar. When the front rings are extended, the divisions between them are seen to be deep blue. Head grey, with darker stripe and paler lines. Occasionally several white marks appear on the back, and this is stated by Professor Poulton to occur more especially in the caterpillars when the twigs and stems of the food plant upon

which they have grown up are covered with grey lichen. Sometimes the caterpillar has been reported as destructive in orchards; two or three large ones feeding on a small apple tree would certainly afford evidence of their presence in the shape of denuded twigs, but it is doubtful if they ever occur in sufficient numbers to cause any very serious damage to fruit trees.

The chrysalis is dark brown, inclining to blackish, and covered with a whitish powder, which does not shake off. It is enclosed in a long, grey-brown, tight-fitting cocoon of silk and hairs of the caterpillar, which is generally spun up among the lower twigs, or to the stem of the food plant.

The moth emerges in June or July, and is on the wing at night, when it may be sometimes netted as it flies along or over hedgerows. When caught in this way it dashes about so wildly in the net that it is rarely of much value for the collection. The same may be said of examples taken by light, which at times attracts the moths freely. When resting in the daytime, it very closely resembles a withered bramble-leaf or bunch of leaves. The fore wings are folded down, roof-like, over the hind wings, which are flattened out and their edges project beyond the margins of the fore wings. It is, however, very rarely seen in the open at such times.

The species does not seem to have been recorded from Ireland or from Scotland, but it has a wide distribution in England, although much less frequently met with in the north than in the south. In the Cambridge fens it is perhaps more plentiful than elsewhere, but it is not uncommon in some parts of Berkshire, Huntingdonshire, and Kent. The range abroad extends through Central, Southern, and Eastern Europe, to Armenia, Tartary, Siberia, and Amurland; it is also represented in China, Corea, and Japan.

Pl. 64

I 128

Kentish Glory Moth.

Eggs, natural size and enlarged; caterpillars, chrysalis and cocoon.

Pl. 65.

Kentish Glory.
1 *male* ; 2 *female.*

K 129.

ENDROMIDÆ.

The Kentish Glory (*Endromis versicolora*).

This species has the fore wings of the male brownish clouded and suffused with ochreous ; there is a white patch at the base, and some white marks including three spots towards the apex, on the outer marginal area ; two black cross lines, the first inwardly and the second outwardly, edged with white ; the space between the lines is sometimes clouded with whitish, and there is an almost central black >-shaped mark. Hind wings tawny with a black central line, some brownish marks beyond, and sometimes two white spots at the upper angle. The female is much larger in size, without ochreous suffusion on the fore wings, and the hind wings have the ground colour whitish. It varies in the tone of the brown colour, and, in the male, in the amount of ochreous suffusion (Plate 65).

The eggs are laid in rows, generally two deep, on a birch twig. At first they are greenish, but soon change to brownish olive or shining purplish brown.

When young the caterpillars cluster together on the twigs, as shown on Plate 64. They are at first black with glossy dots, and later, greenish, but still dotted with black. After the third skin change, they are without the black dots, and the colour is then pretty much that of the mature caterpillar, which is green, rather whitish on the back, and with a dark green central line ; a series of seven creamy oblique stripes along the sides, and on the sides of the first three rings there is a whitish stripe broken at the divisions ; these markings are often edged with dark green ; on the eleventh ring there is a somewhat horn-like prominence, striped with creamy white, and below it a yellow stripe ; the spiracles are white, ringed with black. Head small, paler green, with whitish marks. Feeds on birch, from late May to

July. Alder, sallow, and lime have also been mentioned as food plants.

The rough, blackish, or sooty-brown chrysalis is enclosed in a coarse netted cocoon, dark brown in colour, and more or less covered with moss, leaves, or other material, among which it is spun up, generally on the ground, but sometimes just under the surface. Assisted by the points on the rings of the body, the chrysalis is able to work itself partly out of the cocoon, and this it does some days before the moth emerges.

The moths usually emerge in late March and in April, earlier or later in some seasons. They do not always come up the year after pupation, but often remain two or more winters in the chrysalis.

The males fly in the sunshine, and are very strong on the wing; the females are not active until dark. This sex has been found resting on the twigs of birch, also on heather, and occasionally on a tree trunk. The males "assemble" freely to a freshly emerged female. The species inhabits the more open parts of woods and forests, moors and hillsides where birches flourish. It is probably more plentiful in its Scottish localities, such as Rannoch and Forres, than elsewhere, but it occurs also in Aberdeenshire, Kincardineshire, and Argyllshire. In England it seems to be not uncommon in Wyre Forest, Worcestershire, and the Reading district in Berkshire. It used to be so plentiful in Tilgate Forest, Sussex, that over a hundred males were brought to the net in one day by a bred female put down to allure them. This happened some fifty years ago, and compares curiously with a record of one male attracted by a female in Tilgate Forest, April 13, 1869. Other localities in Sussex that have been mentioned are St. Leonard's Forest and near Petersfield; it has also been found in Herefordshire and in some parts of Suffolk. Distributed over Central and Northern Europe, the range extending to North Italy.

Pl. 66.

K 130

1, 2. **Emperor Moth,** *males;* 3 *female.*

Pl. 57. *K 131.*

Emperor Moth.

Eggs, natural size and enlarged.

Caterpillar and cocoon. (*Photos. by W. J. Lucas.*)

SATURNIIDÆ.

The Emperor Moth (*Saturnia pavonia*).

In a general way the fore wings of the male may be described as purplish grey, suffused with rosy or with tawny shades; a reddish cloud, black marked above, at the tips of the wings; the outer margins are more or less whitish, and there is a whitish patch about the middle of each wing, in which is an eyed spot; the hind wings are tawny, with a central eye spot and a blackish band towards the outer margin. The female has all the wings pale purplish grey, with whitish bordered outer margins; markings much as in the male, but the central area of the hindwings is more or less whitish. There is some variation in the ornamentation; occasionally the white markings are of large size, or, on the other hand, may be almost or quite obscured. Very rarely the eye-spots are absent from all the wings (ab. *obsoleta*, Tutt), and sometimes they are of abnormal shape. Now and then specimens of the female sex are dark in colour, with red bands, and Barrett mentions an example of this sex smoky black in colour, with still blacker markings (Plate 66).

The olive brown, clouded greyish eggs are laid in neatly arranged batches around the stems or twigs of plants; I once found a batch in North Devon on a loose piece of rock. The caterpillar when full grown is bright green, with black markings; the warts from which blackish bristles arise are yellow, sometimes pink or blackish. In an early stage it is black, with an orange line low down along the sides; later on it is still black, but ringed with orange. It feeds in June, July, and August on many kinds of plants, among which may be mentioned heather, bramble, sallow, sloe; also meadow-sweet (*Spiræa ulmaria*) and purple loose-strife (*Lythrum salicaria*).

The curious cocoon formed by the caterpillar (Plate 67) is

so constructed at the narrow end that the moth on emergence can easily pass through; after the insect's escape, the converging fibres forming the "door" spring to again, and the point of exit looks pretty much as before the moth had pushed through. This kind of opening can only be worked from the inside, therefore enemies from without are unable to effect an entrance.

The moths are out in April and May, and the males may be seen on sunny days flying at a great pace over heaths, moorlands, and mosses, also about the borders of woods. The female flies at night, but it may occasionally be met with resting on heather or other herbage in the daytime. A freshly emerged female moth will, as a rule, attract as many specimens of the opposite sex as one would care to take; all that one has to do is to take her in a box to some likely spot, and there await the coming of the males.

The species seems to be generally distributed throughout the British Isles, but is commoner in some parts than in others, and apparently rare in portions of the Midlands.

The distribution abroad extends through Europe to North Asia Minor and Armenia, and to Siberia, Amurland, and Ussuri.

DREPANIDÆ.

The British species belonging to this family, with one exception, have the tips of the fore wings pointed and curved downwards, forming a sort of hook, hence the English name Hook-tips. The exception is *Cilix glaucata*, a round winged moth, not at all like other members of the family, but its caterpillar is very like others of the group.

The bristle and catch arrangement for locking the wings is present in all the species, but the tongue or proboscis is absent, or practically so. The caterpillars are not furnished with anal

claspers, therefore have only fourteen legs, that is, six true legs and eight false legs (pro-legs). The last ring of the body is more or less tapered, sometimes terminating in a point; the back is roughened with raised spots and warts, or humped. They feed on the leaves of trees and bushes, usually exposed, and they pupate in a silken cocoon, spun up between leaves, or in a folded leaf, of the food plant.

Of the eleven species occurring in the Palæarctic Region, seven are European, and six of these are found in the British Isles.

The Pebble Hook-tip (*Drepana falcataria*).

The fore wings are brown, whity brown, or whitish; the central area is crossed by three blackish wavy lines, a blackish blotch in the third line and two blackish dots between it and the second line; beyond there is a dark brown, or reddish-brown curved line from the tip of the wing to the inner margin. Hind wings similar in colour to the fore wings, but paler on the front area; crossed by five wavy dusky lines, sometimes not well marked except on the inner margin; generally, there is a black central dot. The paler forms have a dusky shading on each side of the curved line on the fore wings.

The egg is yellow freckled with orange, chiefly at one end. Caterpillar green, the back reddish-brown, except towards the black-marked yellowish head; two conspicuous warts on rings two to five, and less noticeable raised spots on the other rings, all bearing hairs. In a younger stage it is blackish, with white marks on the fourth and seventh rings; later it becomes greenish below, and the markings on the back of rings four, seven, eight, and ten are whitish or creamy. Until nearly full grown it usually lives on the underside of a leaf, the edges of which are turned over and held down by silken threads; sometimes it may be seen on the upper side of a leaf under a slight web. It feeds

chiefly on birch, but is occasionally found on alder, in June and July, and in September and October, and may be obtained by searching or by beating, but the former, although perhaps slower, is much the better method. The moth is shown on Plate 68, and the early stages on Plate 69.

The species is widely distributed, and seems to occur, sometimes commonly, wherever there are birches, especially of bush-like growth, in most English counties and also in Scotland. In Ireland it appears to be somewhat local and scarce.

The Scarce Hook-tip (*Drepana harpagula*).

The general colour of this species is brownish ; the fore wings are slightly tinged with ochreous and speckled with minute violet-tinged silvery scales ; between the first and second brown lines there is an irregular ochreous brown mark enclosing yellowish spots ; the violet-tinted glistening scales are most in evidence on both sides of the black mark before the outer margin. Hind wings similar in colour to the fore wings ; crossed by two brown lines, the second with an ochreous brown blotch above it (Plate 68).

Caterpillar, yellow freckled with brown ; clouded with brown on first three rings ; a reddish brown irregular stripe runs along the sides and upwards towards middle of the back on rings five, six, eight, and nine ; a double-pointed hump on the back of ring three, the points tipped with yellow. Head notched on the crown, dotted and clouded with brown. It feeds on the small-leaved lime (*Tilia parvifolia*), and may be found from July to September and even later. I have not seen a living caterpillar of this species ; the above short description has been drawn from an inflated skin (Plate 69).

The only British locality for this species is the Leigh Woods near Bristol, where it was first met with in 1837. It is, however, very rare and difficult to obtain. Abroad it ranges through

Pl. 68. K 134.

1. **Scarce Hook-tip,** *male;* 2 *female.*
3, 5, 6. **Pebble Hook-tip,** *males;* 4, 7 *females.*

Pl. 69.

K 135.

1, 1*a*, 1*b*. **Scalloped Hook-tip:** *eggs, caterpillar and chrysalis.*
2, 2*a*. 2*b*. **Pebble Hook-tip** : *caterpillar, chrysalis and cocoon.*
3. **Scarce Hook-tip :** *caterp llar.*

Central Europe to Livonia, Southern Sweden, and to Northern Italy. On the Continent the caterpillar feeds on the foliage of other trees than lime, and there are two broods in the year.

The Oak Hook-tip (*Drepana binaria*).

The male is of an ochreous-tinged brown coloration ; all the wings are crossed by two slender deep ochreous lines, and have two obliquely set, almost central, black dots ; outer margin of fore wings often blackish, marked towards the tip; the hind wings are deep ochreous on the front marginal area. Fore wings of the female paler, and the hind wings ochreous yellow ; the cross lines on the latter often lost in the ground colour (Plate 71).

In freshly emerged male specimens the brown is sometimes purplish tinged, and in some examples of the same sex the hind wings may be described as ochreous, with brown bands. The female occasionally has the fore wings tinged with greyish, and the hind wings are sometimes banded with brown, especially on the inner marginal area.

The caterpillar is ochreous brown with a double-pointed hump on ring three, a yellowish diamond on the back of rings five to ten ; the front and hind rings are brown, more or less tinged with purple ; yellowish lines, shaded below with purplish brown, on the sides meet on the back and form an edging to the diamond mark. The figure on Plate 70 shows the caterpillar in its usual resting attitude. It feeds on oak.

A widely distributed species in the southern half of England, but not especially abundant in any locality, and not known to occur north of Lincoln.

The Barred Hook-tip (*Drepana cultraria*).

Fore wings pale fulvous or ochreous brown, with two paler cross-lines on all the wings, space enclosed by the lines darker brown ; a black or blackish central dot, and before the brownish

outer margin there is a pale line ending on the tip of the wing. The hind wings have an obscure dusky central dot placed in the upper edge of the band, and usually there are two brownish bands on the outer marginal area, but these do not extend to the front margin. Except that the female is generally larger, and the antennæ are simple, the sexes are much alike (Plate 71).

This species is best distinguished from *binaria* by the dark bands, and the straighter second line. The central dots are less trustworthy characters, because summer specimens of the present species often have two of these spots on the fore wings (var. *æstiva*, Spr.), and in occasional examples of *binaria* the lower central spot of the hind wings is absent. As a rule, however, the central dots are more conspicuous in *binaria* than in *cultraria*. The egg is yellowish, tinged with reddish at the ends and along the sides. The caterpillar is somewhat similar to that of the last species, but the hump on ring three is smaller, and the side lines and diamond mark are whiter. It may be found in June and July, and again in September, and even in October in some years. It feeds on beech (Plate 70).

This species is found where beech trees occur, preferably on a chalky soil, in the counties of England from Norfolk southwards. The male may often be seen in May, flying around the beech trees or neighbouring bushes, in the sunshine; or both sexes may be caused to leave their resting places among the foliage by tapping the boughs.

Its range extends through Central Europe to Asia Minor.

The Scalloped Hook-tip (*Drepana lacertinaria*).

The name Scallop Hook-tip given to this species by Moses Harris in 1775, doubtless referred to the ragged outlines of the fore wings. These wings are pale brown in colour, freckled and clouded with darker tints, and crossed by two dark-brown lines; the central dot is black, but often minute; fringes

white, chequered with brown. Sometimes the freckling is heavy and the clouding very dark, becoming almost black on the outer margin ; such specimens seem to be referable to var. *scincula*, Hübn. In another form the fore wings are ochreous brown, with very tiny freckling and only light clouds on the upper part of the outer margin. The hind wings in all the forms are pale whitish brown, with a black central dot, and brown marginal line ; in the darker specimens these wings are clouded or suffused with dark brown (Plate 71).

The egg is pale yellowish when laid, but changes afterwards to reddish. The full-grown caterpillar is pale brownish, marked with darker or reddish brown on the back and sides, and raised spots ; there are double-pointed humps on rings two and three, and a similar but smaller elevation on ring eleven. In the younger state the caterpillar is blackish, with whitish marks on the fourth, seventh, and eighth rings, and some white dots on the end rings. It feeds on the upper surface of the leaves of birch in June and July, and again in August and September.

Chrysalis, reddish brown, the ring divisions blackish grey ; powdered with whitish, and appearing as though dusted with flour. Attached by the anal spike to the interior of the silken web-like cocoon. In the Figure (Plate 69) the pupa is shown hanging from the ruptured cocoon, upon the covering leaf of which a half-grown caterpillar is depicted.

The moth is out in May and June, and a second generation appears in August. It is not uncommon in most birch woods, and on heaths and commons, where birch flourishes ; but the perfect insect, which rests on leaves and twigs of trees and bushes, and the herbage under them, is not so frequently or so easily obtained as the caterpillars. The latter may be searched for in the daytime, or they may be dislodged by beating.

Widely distributed throughout England, but local or scarce in Lancashire and Yorkshire and northwards ; also, according to

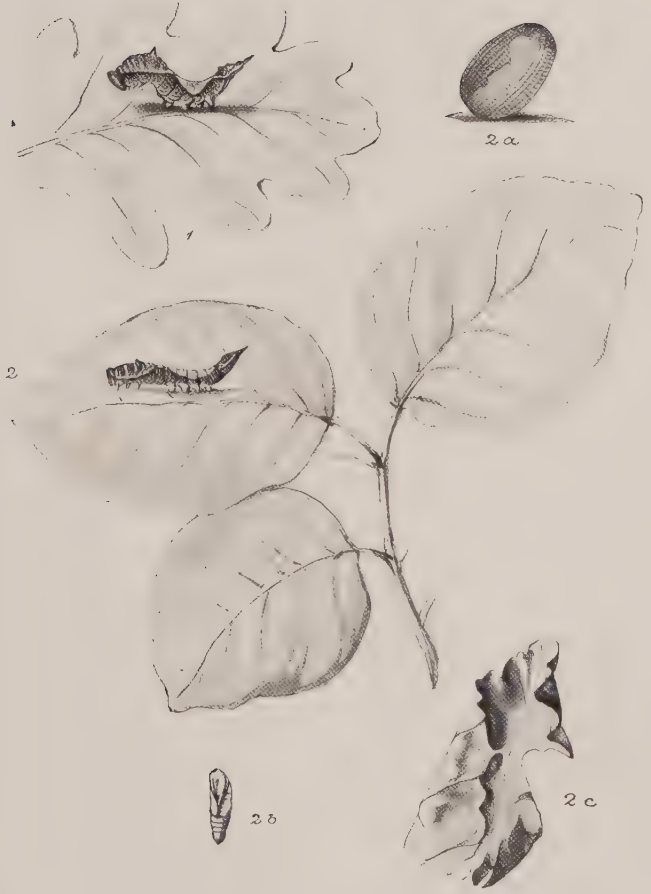
Barrett, in Devonshire and in the fens of Norfolk and Cambridge. It occurs in the Clydesdale district, Ross, Argyllshire, and Sutherland in Scotland; and in Ireland it seems to be widely spread and common in some localities.

The Chinese Character (*Cilix glaucata*).

Probably in reference to the grey-brown oval blotch on the middle of the white fore wings, this moth was known to the older entomologists by the English name of "Goose-egg." On the blotch, however, there are silvery marks on the veins, and below it (often attached) there is a blackish blotch with some bluish silvery scales upon it. These markings probably suggested to Haworth the name Chinese Character by which it is commonly known (Plate 71).

The caterpillar is reddish brown, with a darker line along the back, and a paler patch on rings three to five, extending as a narrow stripe to the dark-brown spiked tail; two raised warts on rings two and three, with a white dot between the hinder pair. Head darker brown, paler in front. It feeds in June and early July, and in September and October, chiefly on hawthorn and sloe, but it will also eat apple and pear. The chrysalis, which is enclosed in a brown, rather tough, silken cocoon, spun up among leaves or under loose bark, is greyish on the wing covers, and reddish on the body.

The moth is out in May and early June, and again from late July well into August. Sometimes it may be seen resting on a leaf in a hedgerow. When disturbed in the daytime, which may happen where one is beating the bushes, it falls, rather than flies, to the ground. At night it may be netted as it flies along the hedgeside or wood borders in almost every county of England and Wales. In Scotland its range seems not to extend north of Clydesdale. Kane states that it is "widely spread, but not generally at all numerous" in Ireland.



Pl. 70. *K* 138.

1, **Oak Hook-tip:** *caterpillar.*

2, 2*a*, 2*b*, 2*c*. **Barred Hook-tip:** *egg, enlarged; caterpillar, chrysalis and cocoon.*

Pl. 71. *K* 139.

1. **Oak Hook-tip,** *male*; 2 *female*. 3. **Barred Hook-tip,** *male*; 4 *female*.
5, 7. **Scalloped Hook-tip,** *males*; 6, 8 *females*.
9. **Chinese Character,** *male*; 10 *female*.

NOLIDÆ.

Some thirteen or fourteen species occurring in Europe are referred by Staudinger to this family. Only five of these occur in the British Isles. The moths are of rather small size, less, in fact, than some of the so-called "Micros," among which they have been placed. Probably they may, for this reason, be overlooked. They mostly sit head downwards on the trunks, branches, or leaves of trees, sometimes on palings, but the rarer ones hide themselves among the thick, low herbage. The time of flight is after dark, and the moths occasionally visit the sugar patch. The caterpillar has only eight false legs (prolegs), the first pair being the absent ones; the body is clothed with tufts of hair, the hairs of the front and rear tufts longer than the others. When full grown it spins a more or less spindle-shaped, toughish cocoon of silk mixed with the larval hairs, which is usually coated with particles scraped from the surface of twig or stem upon which it is spun up.

The Short-cloaked Moth (*Nola cucullatella*).

The fore wings are whitish or greyish, with a dark, almost black, patch at the base; this patch is marked with whitish, and is limited by the first cross line, which is black and curved; the second line, also black, is wavy and curved inwards towards the front margin; between these lines is a dusky central shade, commencing in a blackish spot on the front margin, and sometimes forming an inward border to the second line; a raised tuft of white, grey-capped scales on the basal patch, and two other tufts beyond it and in a line with the front margin; hind wings dark grey, paler towards the base (Plate 73).

The caterpillar is reddish brown, clothed with short greyish hairs; the spots and central line on the back are whitish. It

hatches from the egg early in August, and after feeding for a while, retires to winter quarters, selecting some sheltered cranny, such as a chink in the tree bark, where it spins over itself a few strands of silk. Feeding is resumed in May and June, after hibernation, usually on the upperside of leaves of sloe and whitethorn, and also of fruit trees, such as apple and plum, and sometimes pear (Plate 72).

The moth is out in June and July. It flies at dusk.

Widely distributed and generally common in the south of England ; somewhat rare in Scotland—perhaps overlooked. It has been reported from Ireland, but is not mentioned by Kane in his catalogue of Irish Lepidoptera.

The Small Black Arches (*Nola strigula*).

Fore wings greyish white, freckled and dusted with grey brown at the base and on the front and outer margins ; two black wavy and toothed cross lines ; between the base of the wing and the second line are three raised tufts of grey brown tipped whitish scales : hind wings dark grey, paler towards the base (Plate 73).

The caterpillar feeds, probably after hibernation, from April to June, on the undersides of oak leaves. It is pale ochreous in colour, with pale reddish brown warts and star-like tufts of hair ; a blackish bar on the back of ring six ; head blackish.

The moth emerges from the chrysalis in July. It occurs in oak woods in Kent, Surrey, Sussex, Hants, Somerset and Gloucestershire ; also in Berks, Norfolk, Suffolk, and Essex but it is very local and seems to be restricted to a more or less limited area in all its known haunts, among which the most favoured are perhaps the New Forest in Hampshire and Abbots Wood in Sussex. In some years it may be fairly common, or even plentiful, and then becomes quite scarce during several seasons in the same place. Recently recorded from Herts.

The Least Black Arches (*Celama cristatula*).

Very similar to the last species, but whiter ; the first line is curved towards the second tuft of raised scales, thence gently curved to the inner margin, above which there is a slight inward angle or elbow ; the second line is less wavy ; hind wings whitish grey with a black central dot, and in the male whiter along the inner area. The head and palpi of this species are white, but *strigula* has a greyish white head and dark palpi. Again, the antennæ in the male of the present species are ciliated, but in male *strigula* they are bipectinated (Plate 73).

The caterpillar, which feeds in July and August on the leaves of oak, beech, sloe, and apple, etc., is reddish, inclining to yellow on the back, which is traversed by black lines, the central double and interrupted on rings seven to nine by rusty V-shaped marks.

The moth flies in May and June.

This species appears to have a wider distribution than either of the others. It is the only one known with certainty to occur in Ireland, and it is widely spread in that country. In Scotland it is found in Perthshire and Ayrshire, and probably is present in other parts. In England it is obtained in most counties, except perhaps the northern, although it has been recorded from various parts of Yorkshire (see Appendix).

The Kent Black Arches (*Nola albula*).

Fore wings white, largely light brown between the obscure cross lines ; outer marginal area clouded, and front margin dotted with light brown ; three tufts of raised scales placed as in previous species ; hind wings of the male, greyish white, browner on the outer margin ; of female, brownish grey. Varies in the amount of light brown, and sometimes this is much reduced ; more rarely it disappears entirely (Plate 73).

The caterpillar varies in colour from ochreous with pink tinge to bone white ; the warts are set with pale hairs and those along the back and at each extremity are longest ; a double greyish line along the middle of the back, and a series of black marks on each side ; these marks unite across the back on rings six and ten. After hibernation, it feeds in Spring until June, on the young growth of bramble, raspberry, strawberry, and cinquefoil (*Potentilla reptans*), and is stated to also eat hemp agrimony (*Eupatorium cannabinum*). The brownish cocoon is constructed on a stem of grass and in appearance looks not unlike a swelling of the stem.

This species was first observed in England in the year 1859, when four specimens were taken in July at Chattenden Roughs, a large hilly wood in North-east Kent. It still occurs, no doubt, in the Kentish locality referred to, but is now very scarce there compared with what it must have been some twenty-five years ago. Barrett notes a specimen from the Isle of Wight. Mr. G. T. Porritt states that he has seen one of two examples captured in South Devon in 1901 ; and another, a male, has been recorded as taken at light in a house near Weymouth, Dorset, in August, 1904, and from Lewes in 1906.

At the time the first specimens were met with in England the species seems to have been rare, or little known on the Continent. Since then knowledge of its distribution has vastly increased, and it has now been found not only in many parts of Central Europe, but also in Finland, Italy, Dalmatia ; Asia Minor, Persia, and extending into Amurland and Japan.

The Scarce Black Arches (*Celama ærugula*).

The general colour of this moth is white ; the fore wings more or less sprinkled and clouded with brownish grey or dark grey, and crossed by two black lines, the first curved and the second slightly waved, indented and edged inwardly with

Pl. 72. *K* 142

1, 1*a*. **Short-cloaked Moth**: *caterpillar and cocoon.*

2, 2*a*, 2*b*. **Green Silver-lines**: *caterpillar, chrysalis and cocoon.*

3, 3*a*, 3*b*. **Scarce Silver-lines**: *caterpillar before hibernation, chrysalis and cocoon.*

4, 4*a*. **Large Marbled Tortrix**: *caterpillar and cocoon.*

Pl. 73. *K* 143.

1. Cream-bordered Green Pea. 4. 7. Green Silver Lines. 10. Scarce Silver Lines.
2. 3. Short-cloaked Moth. 5. Small Black Arches. 6. Least Black Arches.
13. Kent Black Arches. 8. 9, 11, 12. Scarce Black Arches.

ochreous brown ; the three raised tufts are white, capped with grey (Plate 73).

This is the only really variable species among the five occurring in this country. In some specimens the space between the cross lines is largely filled in with dark grey, and in other specimens the wings are almost entirely white, traces of the cross lines being the only markings.

Mr. Robert Adkin, who has reared this species from the egg, kindly allowed me to select specimens from his fine series to illustrate the range of aberration ; these are figured on Plate 73.

Caterpillar brownish inclining to purplish, with an ochreous line along the middle of the back and some brown V-shaped black marks. Head blackish brown. It feeds in May, after hibernation, on various clovers, preferring the blossoms, and bird's-foot trefoil (*Lotus corniculatus*).

The moth appears some time between mid-July and mid-August. The late Mr. Tugwell, by keeping some larvæ, reared from the egg, in a warm room induced them to feed up instead of hibernating, and they attained the moth state in December.

This is another exceedingly local species in England. It was first taken at Bembridge in the Isle of Wight in 1858, and one or two specimens have since been obtained in that island. Examples have also occurred on the cliffs near Hastings, and at Folkestone ; and one has been recorded as taken in a light trap at Woodbridge in Suffolk, July 21, 1904. The headquarters for the species in this country are the Deal sand-hills, on the Kentish coast, where it was discovered over a quarter of a century ago, and probably occurs still.

WESTERMANNIINÆ

Authors are not at all agreed as to the systematic position of this family, and there seems to be some difference of opinion as to the species that properly belong to it. Sir George Hampson

has transferred the group to the Agrotidæ and separated *S. revayana* from the others, placing it in his sub-family Sarrothripinæ, to which also belong certain Indian species.

Only four species occur in our islands. Three of these have green fore wings and pale grey or whitish hind wings. The other species, *Sarrothripus revayana*, has the fore wings of various shades of grey, brown, or blackish ; its boat-shaped cocoon is very like a small edition of that of *Pseudoips bicolorana*, and, although the caterpillar is in some respects not very dissimilar to those of the green-winged species, the moth does not seem quite to be one of their set.

The Cream-bordered Green Pea (*Earias clorana*).

In size, colour of the fore wings, and general appearance this moth might be mistaken for the much more common Green Tortrix (*Tortrix viridana*). On examination however, it will be seen to have white hind wings, whilst those of the *Tortrix* are grey. Again, the head, front of thorax, and front edge of the fore wings are white in the present species (Plate 73).

The caterpillar is green, inclining to whitish on the back, the latter lined with brownish, and bearing warts on rings six and eleven. It feeds in July and August on the terminal leaves of osier and willow ; these leaves are drawn together with silk, and the solid appearance of the foliage at the end of the twig will afford a clue to the probable whereabouts of the caterpillar when one is searching for it. Chrysalis, brown, darker on the back, paler on the under parts, and on the wing covers ; enclosed in a tough boat-shaped cocoon which is often constructed on the bark of a twig or stem of the food plant. As a rule the moth does not emerge until the following year, but in some years a few will appear in the autumn, and others remain in the chrysalis until the following May or June.

This species inhabits damp places where there are osiers,

and it is especially common in the fens. It occurs in most of the southern and eastern counties of England. It was taken for the first time in Ireland at Glengariff in 1914.

Green Silver Lines (*Bena prasinana*).

The bright green fore wings are crossed by two shaded silvery lines, and a narrow silvery band, the latter running from the tip of the wing to the inner margin, and usually there is a whitish shade between the two lines ; the fringes are reddish, or pinkish, and the front and inner margins are tinged with the same colour, sometimes strongly so on the inner margin. The hind wings of the male are whitish, tinged with yellowish green ; fringes white, more or less tinted with reddish ; in the female the hind wings are entirely silky white. Antennæ reddish (Plate 73).

Caterpillar, green, with yellowish dots, lines on the back, and edging to first ring of the body ; the anal claspers are marked above with red. It feeds in August and September on the leaves of oak, birch, beech and nut (Plate 72).

The chrysalis is purplish above merging into pale brown beneath ; wing-cases ochreous brown ; the dorsal surface, especially the ring divisions, are dusted with whitish dots. It is enclosed in a papery cocoon of a pale pinky brown colour ; frequently spun up on the back of a leaf, but also in a curled leaf, bark chink, or among herbage and litter on the ground.

The moth flies in June and July, and is not uncommon in woods throughout the greater part of England, it may be beaten from trees, and is often to be seen sitting on bracken and other undergrowth. It is also found in Scotland up to Moray, and seems to be pretty generally distributed in Ireland. The range of this species abroad extends through Northern and Central Europe, South Russia, Siberia, to Japan.

Scarce Silver Lines (*Pseudoips bicolorana*).

The green colour of the fore wings of this moth is rather paler than of those of the last species ; they are crossed by two almost parallel yellowish lines ; hind wings white and silky. Antennæ whitish towards the tip and reddish towards the base (Plate 73).

Caterpillar green, sometimes tinged with yellow, a dark line along the middle of the back is edged on each side with whitish.

The chrysalis is pale greenish, with a narrow black stripe from the head along the thorax extending to the fourth abdominal ring ; the wing cases reach the sixth ring, which together with the back of the fifth are roughened with fine blackish points.

Cocoon boat-shaped with the keel raised at the head end. When the moth emerges from this end the cocoon closes up tightly again, so that no opening is to be seen ; slight pressure on the back will cause the exit slit to open.

This rather local species is perhaps commoner in the eastern counties of England than elsewhere, but it occurs in the oak woods of Berkshire, and southward to Kent and Hampshire. Much scarcer in the west and midlands, and apparently unknown in the north. Barrett gives Galway and Queen's County in Ireland, but adds that it is rare.

Distributed over Central and Southern Europe, and its range extends to South Sweden, and Asia Minor.

SARROTHRIPINÆ.

The Large Marbled Tortrix (*Sarrothripus revayana*).

This is a most variable species, ranging from greyish white through various shades of brown to blackish ; the grey and the

brown forms are sometimes tinged with green. In the illustration some of the more usual form of marking are shown. 1 (more or less typical) and 2 are the most common; 5 (*ramosana*) is less frequently met with; 4 (*ilicana*) has ashy brown fore wings with a black bar at the base, three black dots on the disc, and a series of black dots before the outer margin, the triangular marking on the front margin is reddish; 3 is a modification of the typical form approaching var. *dilutana;* 6 is

FIG. 23.
Large Marbled Tortrix.

of the *afzelianus* form, with shiny brownish fore wings and black markings (see Appendix).

The caterpillar is green with whiter ring divisions; a few long whitish hairs on each segment; a faintly darker line along the back, and a paler interrupted line along the sides. Head yellowish green marked with brownish and sparsely clothed with whitish hairs. It feeds in June and July on the leaves of oak and sometimes on sallow. It spins a whitish boat-shaped cocoon on the under side of an oak leaf or twig, and therein turns to a pale green chrysalis with a broad purple brown stripe along the back from the head; the blunt last ring is tinged with purplish brown and the edge of the ring immediately before it is fringed with minute hooks (Plate 72, Figs. 4, 4*a*).

The moth seems to be out from August to April. It may be

beaten from trees and bushes throughout the autumn, and during the later months of the year it seems to hide in yews and hollies. Just before dusk it becomes active and may then be netted as it flies ; later on it may be seen regaling itself on overripe blackberries, or on the ivy blossom, and it is not an infrequent visitor to the sugar patch.

The species has been found in almost every part of England and Wales wherever there are oak woods. In Scotland it occurs up to Argyllshire and Moray. For Ireland, Kane gives Tyrone, Westmeath, Galway, Kerry, Limerick, and Cork (Don.).

Distribution abroad: Central and Southern Europe, extending northwards to Scandinavia, and eastwards to Amurland and Japan.

ARCTIIDÆ.

In this family Staudinger includes 161 species known to occur in the Palæarctic Region. About forty of these are found in Europe, and thirty-one of the latter rank as British species.

The family is usually divided into two sub-families—Arctiinæ and Lithosiinæ, fifteen of our species being referred to the former and sixteen to the latter. In both groups the caterpillars are hairy, but the hairs are usually longer in those of the "Tigers" than in those of the "Footmen" ; the latter, too, are lichen feeders, whilst the others prefer the foliage of plants.

Tiger Moths (*Arctiinæ*).

The moths in this sub-family have short, or, rather, stout bodies, and ample wings ; and as the tongue is imperfectly developed in most of the species, flowers have not the same attraction for them as for the long-winged and slender-bodied Lithosiinæ, most members of which have this organ well developed.

Pl. 74

White Ermine Moth.
Caterpillar, chrysalis and cocoon

L 148.

Pl. 75.

1, 2, 3. **White Ermine Moth.**
4, 5. **Muslin Moth,** *females*; 6 *male.*
7. **Water Ermine,** *male*; 8 *female.*

L 149.

The White Ermine (*Spilosoma lubricipeda*).

Older English names for this generally distributed and often common species are The Great Ermine Moth of Wilkes (1773), Harris (1778), and The Large Ermine of Haworth.

On Plate 75 will be found three colour-forms of the moth. Fig. 1 has the typical whitish colour, Fig. 2 is creamy on the fore wings, and Fig. 3 has the fore wings buff. The last represents a specimen from Scotland, where, especially in the western parts of the country, and also in the north of Ireland, and the north-west of England, buff forms, both paler and much darker than the one figured, are not uncommon. Sometimes the Scottish specimens have smoky hind wings. As regards the black spots on the wings, the species is subject to considerable variation. In some examples almost all the markings are entirely absent; in others they are very small and numerous, or large in size and number; the central spots on the fore wings are often united, forming irregular designs. Again, there may be an unusual amount of black spotting on the outer margins, and all other parts of the wings free of spots. All these aberrations in marking, except, perhaps, the central cluster, seem to occur in the various colour forms. An uncommon form, known as var. *walkerii*, Curtis (Plate 78, Fig. 5), has the black scales gathered together into streaks along the nervures of the fore wings; modifications of this variety have also been found, or reared. Possibly by the careful selection of parent moths showing tendency to the streaked aberration it might happen in a generation or two that var. *walkerii* would turn up in the breeding cage to reward the rearer for trouble taken in the experiment.

The caterpillar, which is often not uncommon in gardens in August and September, or even later, is brown, with long hairs, and a reddish stripe along the middle of the back. It feeds on

the foliage of low-growing plants, and does not appear to be specially attached to any particular kind. The chrysalis is dark brown, in a close-fitting cocoon of silk and hair from the caterpillar, spun up in odd corners on the ground or at the base of a wall or fence, sometimes between the pales (Plate 74).

The moth emerges in June, and may be seen sitting on walls, fences, trees, or on the herbage growing on hedge banks; or even on the bare ground. It often flies into houses when lighted up, and is a frequent attendant at the public gas lamps and electric lights. The geographical range of this species extends through Northern and Central Europe southward to North-West Africa, and eastward to Amurland.

The Water Ermine (*Spilosoma urticæ*).

The specimens of this white moth, depicted on Plate 75, are of the form usually met with in Britain. To Haworth, Stephens, and other early entomologists this was known by the English name of the "Water Ermine" (*S. papyrata*, Marsham), whilst a rarer form—with a minute dot on the disc of the fore wings, and three dusky spots on the hind wings, as in the White Ermine—was the "Dingy White" of Haworth. Occasionally specimens are obtained with extra black spots on the basal and front areas of the fore wings.

Caterpillar, dark brown with a purplish tinge, the hairs, arising in spreading tufts from black warts, are dark brownish; spiracles white; head black and glossy. Feeds in July and August on a variety of marsh plants, among which are yellow loosestrife (*Lysimachia vulgaris*), mint, (*Mentha aquatica*), lousewort (*Pedicularis*), water dock (*Rumex hydrolapathum*), and iris. It seems to affect plants growing under bushes, rather than those more exposed. It is, presumably, not difficult to rear in confinement, as there is a record of eight broods belonging to three generations, and all descendants of a captured female, having

Pl. 76. *L* 150.

Buff Ermine Moth.

Eggs, natural size and enlarged; caterpillar, chrysalis and cocoon.

Pl. 77.

Buff Ermine Moth *and varieties.*

L 151.

been reared by Mr. Bacot. Chrysalis dark reddish brown, in a cocoon similar to that of the last species.

The moth, which emerges in June, is rarely seen away from its favourite haunts, which are marshes and fens; its English name is therefore a very appropriate one. It is not often observed in the daytime, but is on the wing early in the evening, and later on is pretty sure to be attracted to any strong light that may be set up in its neighbourhood. The best localities for the species seem to be the fens of Norfolk and Cambridge, but it used to be fairly plentiful in many suitable parts of East Kent, and no doubt still occurs in some of the marshes between Dartford and Gravesend: it is found in Sussex in the Lewes and Brighton districts, and has been recorded from Kimmeridge in Dorsetshire, from the Isle of Wight, from near Burton-on-Trent, from the Lançaster district, and from Pembrokeshire, South Wales. In Scotland it is rare, and, with the exception of one example reported as taken in an illuminated moth trap at Clonbrock, May, 1896, not known to occur in Ireland.

The distribution abroad extends over Central and Northern Europe, through South Russia to Amurland.

The Buff Ermine (*Spilosoma lutea*).

This species is now known by the English name of the Buff Ermine, but the names bestowed upon it by some ancient writers were perhaps hardly more suitable. Thus Wilkes in 1773 called it the "Spotted Buff Moth," and Harris five years later dubbed it the "Cream-dot Stripe." The ground colour is generally some shade of buff, in the paler specimens merging into cream, and in the darker to yellowish ochre. In the matter of black marking the range of variation is extensive. The specimens figured on Plate 77 illustrate something of this variation, both as regards colouring and marking. The females are, as a rule, paler than the males, but occasionally examples

of the latter sex are quite as pale as any female. Figures 7 and 8 approach var. *zatima*, Cramer. Originally this form was only known to occur in Heligoland. The same, form, or a modification of it, was described by Haworth as *radiata*, from a Yorkshire specimen. Then, in 1837, specimens of the variety were reared with the normal form of the species from caterpillars obtained at Saltfleet in Lincolnshire ; and subsequently a few more examples were reported from the last named county, and elsewhere. In 1891 a specimen of var. *zatima* emerged from an assortment of chrysalids sent to Mr. Harrison of Barnsley (*vide Entom.*, 27, pp. 95/97). This particular specimen was of the female sex, and it paired with a male which was also an aberration, but not of the *zatima* form. Some of the offspring resulting from this union were of the female parent form, others favoured the male parent, and others again were intermediate. In the course of a few generations almost entire broods of the *zatima* variety were obtained. Allowing the sexes of *zatima* to mate with those of more or less ordinary *lutea*, the late Mr. W. H. Tugwell obtained many very interesting aberrations, one of which he named var. *eboraci*, and another *fasciata*. The *zatima* form and its various modifications have now been reared by entomologists all over the country, and presumably directly or indirectly from the original Barnsley stock. In Yorkshire especially the race has been improved ; the specimens are larger and darker, and there is a tendency towards the almost entirely black form known as var. *deschangei*.

The pale whitish green eggs are laid in batches on leaves, sometimes high up on birch trees, or virginia creeper, but more usually on the foliage of low growing plants ; it is often common in gardens. At first the caterpillar is tinged with yellowish, but it afterwards becomes greyish, and finally brownish. When full grown the hairs, with which the body is clothed, are brown ; there is a yellowish or whitish grey stripe along each side, and an obscure somewhat reddish

tinted line down the middle of the back. Head glossy brown.

The glossy reddish-brown chrysalis is enclosed in a dingy coloured web-like cocoon, which is spun up among leaves or litter on the ground. Mr. R. Adkin found some of these cocoons spun up between the folds of an old brown blanket used as a covering for a rabbit hutch in winter. The moth emerges in June. Occasionally, in confinement, specimens will leave the chrysalis in the autumn instead of passing the winter therein, as they more usually do (Plate 76).

A common and often abundant species over the greater part of the British Isles. Its range abroad extends through Central and Northern Europe, South Russia, and Tartary to Amurland, Corea, and West China.

The Muslin Moth (*Cycnia mendica*).

The early British authors knew this moth as the "Spotted Muslin" or "Seven Spot Ermine" (Harris, 1778). The male is dark brown or blackish, with a few usually obscure black dots on each wing. The female is silky white, with more clearly defined, and often more numerous, black dots (Plate 75, Figs. 4-6). On Plate 78 will be found figures of the rarer and more extreme aberrations of the female. Those represented by Figs. 3, 4, 6, 7, were reared some years ago by Mr. G. T. Porritt, of Huddersfield, who at the same time obtained a number of other interesting intermediate examples ("Trans. Ent. Soc. Lond.," 1889, p. 441, Pl. 14). Variation in the other direction is towards the complete suppression of the black dots; and I have seen specimens with only one such dot on each wing.

In the var. *rustica*, shown on the same plate, it will be noted that the males assimilate somewhat to the female coloration; the specimens (Figs. 1, 2), were bred by Mr. Robert Adkin in 1887. This form was not known to occur in the British

Isles until 1885, when Mr. de V. Kane detected specimens in a collection of insects made in Co. Cork, Ireland. It was next heard of from Belfast, and then, in 1886, again, in Co. Cork, an example of each sex was taken. The female specimen laid eggs, and some of these were sent to Mr. Adkin, who not only was successful in rearing the moths, but in 1889 obtained a pairing between an almost white male *rustica* and an ordinary English female. Only four eggs were laid, and from these two male moths resulted in May, 1890, both intermediate in colour between the two forms. In all its early stages *rustica* is identical with ordinary *mendica*.

Male specimens with pale yellowish grey coloured wings have been reared from eggs laid by a female captured at Eltham, Kent, exhibiting a tendency to the *rustica* form. In the Barnsley district, Yorkshire, the males are paler than usual, but in the Sheffield area of the same county the males are black. From North Durham chrysalids, I have a smoky greyish form of the male.

The caterpillar is brownish grey covered with yellowish brown hairs arising from greyish-ringed pale brown warts; a paler line along the middle of the back, and some white dots forming a broken line below the black outlined spiracles. Head pale chestnut brown, glossy. When newly hatched it is whitish, tinged with yellow and semi-transparent; the dots and hairs are dark grey. After the first moult the colour is greyish with black dots and blackish hairs. Head yellowish, brown tinged. It feeds in July, sometimes earlier, and August, and seems to thrive on the foliage of many kinds of low-growing plants, such as dandelion, dock, plantain, chickweed, etc., and also eats the leaves of birch and rose. Chrysalis, very dark brown, almost black, glossy, but minutely pitted, giving a roughened appearance; enclosed in a close fitting cocoon composed of silk and the caterpillar's hairs, with particles of earth on the outside (Plate 79). The moth flies at night, and

Pl. 78. *I.* 154.

1, 2, 3, 4, 6, 7. **Muslin Moth** *varieties.*
5. **White Ermine,** *var. walkerii.*

Pl. 79.

Muslin Moth.

L 155

Eggs, natural size and enlarged; caterpillar, chrysalis and cocoon.

except that a female may occasionally be seen on the wing, this species is rarely observed in the daytime. May and June are the usual months for this moth, but in 1906 a specimen was attracted to light on November 3.

Widely distributed, and often common in most English counties, in parts of Wales, and in Scotland as far north at least as Ross. In Ireland one male specimen of the typical form has been obtained in Co. Galway, and one in Co. Clare; var. *rustica* occurs in Co. Dublin, and Kings Co., Waterford, Cork, Kerry, and Galway.

The Ruby Tiger (*Phragmatobia fuliginosa*).

The English name given to this moth only suitably applies to the southern reddish form of the species (Plate 80, Fig. 1 ♂). In the north of England the fore wings are darkened with brownish and the hind wings with blackish tints, until in Scotland the only trace of red colour is found on the inner edge of the hind wings (var. *borealis*, Staudinger, Fig. 2 ♀). In these dark specimens the body is also blackish. Very occasionally, specimens approaching the northern form are obtained in South England. A female moth captured by Mr. G. E. J. Crallan in May, 1901, at Bournemouth, laid forty-eight eggs; thirty imagines were bred the same year, two of which were *borealis*. On the south and south-west coasts the black band of the hind wings exhibit a tendency to break up into spots; not infrequently this is completely effected, and the specimens then approach the larger South European form var. *fervida*, Staud. In a fine series of this species from Cornwall, lately seen in Mr. A. Harrison's collection, are a few specimens that come very close to the last-named form. A yellow aberration has been recorded. The eggs are whitish and deposited in batches on leaves. Up to the last moult the caterpillar is greyish or brownish, with dark greyish or blackish

warts from which arise star-like tufts of brown hairs ; a reddish line along the middle of the back, and some reddish spots on the sides. When full grown it is black, and the reddish line on the back is almost hidden by closer and more compact tufts of black hairs. Head black and glossy.

The leaves of various low-growing plants afford it nourishment, but it is very partial to dock, dandelion, golden-rod (*Solidago*), and plantain ; it is also fond of groundsel and lettuce in confinement, but these plants have been found unsuitable if given too frequently. In the open it seems to feed through the summer, hibernate when full grown, reappear in the early spring, and in due course spin its brownish cocoon among herbage generally low down near the ground ; on moors it often makes the cocoon among the twigs of heather as shown on Plate 81. The chrysalis is black, marked with yellowish on the hind edge of each ring. The vitality of the caterpillar is extraordinary. One known to have been embedded in ice for fourteen days at least, became active in less than half an hour after the ice around it melted. It pupated shortly afterwards.

When eggs are obtained early, it is possible to have three generations of the moth during the same year. Thus eggs deposited on May 8 produced caterpillars which fed up quickly and attained the moth state in July. From July eggs some of the caterpillars will outstrip their companions, pupate in September, and appear as moths about a month later. The moth is to be found in May and June, sometimes in July or August, in wood clearings, on moors and rough hillsides, and also in water meadows, etc. It flies at night, is attracted by light, and although it occasionally flies in the sunshine, it is, as a rule, not often seen in the daytime. Occurs throughout the British Isles to the Orkneys. Distribution : Europe, Western and Central Asia, Amurland, Japan, North-west Africa, North America.

Pl. 80. *L* 156.

1, 2. **Ruby Tiger Moth.**
3, 4, 5, 6, 7. **Wood Tiger Moth.**

Pl. 81. *L.* 157

1, 1*a*. **Wood Tiger :** *eggs and caterpillars.*
2, 2*a*. **Ruby Tiger :** *caterpillar and cocoon.*

The Wood Tiger (*Parasemia plantaginis*).

On Plate 80 are shown some of the forms of this attractive and somewhat variable species. Figs. 3, 4, are male and female of the typical form found in England. The most usual phase of variation is in the narrowing or widening of the pale yellowish markings of the fore wings, and the black markings on the hind wings; occasionally the yellow or the black increases to such an extent that the fore wings appear to be almost entirely of the one colour or the other. The hind wings range in colour from the normal yellow through orange to red, and through pale shades of yellow to white; on the other hand they are sometimes almost entirely black. The var. *hospita*, Schiff. (Fig. 7), has all the wings white, and although it has been reported from Shropshire, West Durham, the Lake District, etc., it has been chiefly obtained in the Hebrides and in the highlands of Scotland. Only males of this form are known; the females found with them have heavy black markings on the hind wings, almost crowding out the reddish ground colour. The creamy markings of the fore wings are narrow, and the central spot small.

The full-grown caterpillar is blackish above with greyish-black warts from which arise tufts of blackish hairs, except on rings four to six, where the hairs and the warts at the base of each tuft are reddish; the black hairs of the hinder tufts are the longest (Plate 81).

Twelve eggs laid by a female in Aberdeenshire were received on June 29, 1906. They were shining yellowish in colour, and were on a leaf of plantain. The caterpillars resulting from these eggs were reared on a mixed diet of forget-me-not (*Myosotis*), plantain, and groundsel, but evinced a decided preference for the former. Some died young in moulting, but at the beginning of August five were full grown, and four duly pupated in a slight but roomy cocoon of silk, mixed with the caterpillar's hairs,

in which the blackish brown chrysalis with the cast-off skin attached to the tail was plainly visible. Four moths, all female, emerged at the end of August, when the other caterpillar was still feeding, and seemingly about mature. That caterpillar did not, however, pupate, or survive the winter. As a rule the caterpillars hibernate when about half grown, and feed up in April and May of the following year. The somewhat unusual rate at which those just mentioned completed their growth was no doubt due to the heat of the summer of 1906.

The moth is to be found on heaths, moors, the slopes of chalk, and limestone hills ; also in woods that are not too thickly timbered and have a good undergrowth of heather, etc. The males may sometimes be seen flying in the sunshine, and they will then be noted to wing their way to some particular spot where most likely a freshly emerged female will be the attraction. The male is often started up from the heather or other herbage as one walks along ; or it may even rise from the bare ground upon which it sometimes has a fancy to sit. The female seems to be more sluggish during the daytime.

The species is widely distributed over the British Isles, and its range extends through Central and Northern Europe, and Northern Asia to Japan.

The Clouded Buff (*Diacrisia sannio*).

Fore wings of the male yellow, with a reddish and greyish central mark ; hind wings whitish, with blackish central spot and outer band ; the inner margin, fringes, and front edge light crimson. The female has orange fore wings with reddish margins, veins, and central mark ; hind wings orange, with black basal area, central spot, and outer band (Plate 82).

The female of this species is so different in appearance from the male that it was described by Linnæus as distinct, under the name *russula*. In the tenth edition of "Systema Naturæ" it is

No. 510, whereas *sannio*, the male, is No. 506. We must, therefore, in accordance with the law of priority, adopt the earliest name for the species, however much we regret having to discard the old familiar name of *russula*.

Although the central spot of the fore wings is subject to minor modification in size, shape, and colour, it is in the hind wings that variation chiefly occurs. In the male the blackish grey band on the outer area of the hind wing may be broad and complete, or it may be broken up by the veins into a series of bars ; then, again, the bars tend to become smaller and smaller until only tiny portions remain. Usually, the basal third of the hind wings is more or less greyish, but sometimes the whole surface almost, or quite up to the outer band, is clouded with dark grey. The black markings of the female hind wings are apt to vary in a very similar way.

The caterpillar is reddish brown, covered with brown hairs ; a yellow-marked whitish stripe along the back, and two darkish stripes on the sides ; a white spot below each black margined spiracle. It hatches from the egg in July, and as a rule hibernates when still small, completing growth in April and May. It feeds on the leaves of many low plants, among which are dandelion, dock, chickweed, and plantain. The chrysalis is brown, streaked with greyish, and is enclosed in a flimsy cocoon among herbage, generally on the ground.

The moth, which inhabits heaths and mosses, is on the wing in June and early July ; the male may be put up on sunny days, but the female is not often seen until early evening. After dark both sexes may be found on the heather.

It should be noted here that there are usually two broods of this species abroad, and that in confinement it will develop a more or less complete second brood in September with us. An instance is recorded of sixty-three out of sixty-six caterpillars from eggs laid in early July, feeding up and producing moths in the last week of September. The caterpillar is not an easy one

to deal with during hibernation, so that it would always be to the advantage of the rearer to get it through to the perfect state the same year, whenever possible.

The species is widely distributed over the south and east of England, and South Wales. It occurs in Cheshire in all suitable places ; in Lancashire it is common on the moorlands, as at Witherslack and Methop, and it is not uncommon near Quernmore, Clougha, and other places, in July. Local and somewhat scarce as a rule in Yorkshire, but recorded as not uncommon in the Scarborough district. In Scotland it is found in Roxburghshire, and northwards to Aberdeen ; and, according to Kane, it is widely spread, although local, in Ireland.

The Garden Tiger (*Arctia caja*).

How frequently the collector has had introduced to his notice, by some non-entomological friend, or worthy cottage dame, a "fine butterfly," only to find that the supposed prize, usually imprisoned under an inverted tumbler, was just an ordinary specimen of the gaudy, but common, Garden Tiger. Few persons living in the country, and at all interested in the natural objects around them, will fail to recognize the portraits on Plate 82 ; other figures, however, on Plate 84 will appear strange, and yet they only portray some of the many forms which the moths assume. Possibly it would be true to say that no two specimens could be found that were exactly identical in tint and marking. Even the markings of any one example are frequently not precisely alike on corresponding wings. Normally the fore wings are white or creamy-white with dark brown markings, and the hind wings are red with deep blue centred black spots, often ringed with yellow. The dark markings of the fore wings are most inconstant in size and in form ; in some cases they are so greatly enlarged that these wings might be

Pl. 82. *L* 160

Clouded Buff Moth, 1 *male*; 2 *female.*
Garden Tiger Moth, 3 *male*; 4 *female.*

Pl. 83.

Clouded Buff Moth.

Eggs natural size and enlarged; caterpillar.

M 161.

described as dark brown with narrow, irregular whitish markings (Plate 84, Fig. 1). On the other hand, but less frequently perhaps, the dark markings are narrowed, shortened, and reduced in number, until only spots remain on a white or creamy ground (Plate 84, Fig. 2). The red colour of the hind wings is sometimes crimson in tone, or it assumes an orange tint, and less often it gives place to yellow; the central spots often unite and form a band, or some, occasionally all, disappear; the marginal spots sometimes run into a band.

Besides aberrations such as that referred to above, curious abnormal specimens occur in the breeding cage from time to time, but these are often more or less deformed. It is, perhaps, remarkable, that so few "good things" in the way of varieties are obtained from collected caterpillars, even when these are reared by hundreds. Possibly, if the breeder started operations with a stock of eggs from unusually pale or unusually dark females, and then reserving only the lightest or the darkest, as required, of each generation to continue the experiment, some interesting light or dark "strains" might result in course of time. The objection to this is that before the desired result was obtained the stock might be weakened by "inbreeding," and the moths consequently deformed. If, however, the same line of experiment were conducted by several people, each living in a different part of the country, and with stock selected from the products of his own locality, eggs, caterpillars, or chrysalids might be exchanged, say, after the second year, and in this way the effect of "inbreeding" would be minimized.

The caterpillar, generally known as the "Woolly Bear," is not at all an uncommon object throughout the country, and is, perhaps, even more often noticed in gardens, including those of suburban London. The figures of the early stages of this moth, on Plate 85, are all from material obtained in my own small garden.

The foliage of pretty well all low plants, and tall ones, such as the hollyhock and sunflower, too, seem to be equally acceptable to this larva. It is not often seen before hibernation, but in the early days of spring it will be noticed sunning itself on walls and fences that have a good crop of nettles, dock, or other weeds at their base or around them ; or it may be searched for on the undersides of dock, etc. Mr. Frohawk records these caterpillars as swarming from mid-May to mid-June, 1904, in the Scilly Isles. He states that they occurred in such myriads that no vegetation escaped them, and that they devoured anything from stonecrop to the foliage of shrubs of various kinds. Every path and roadway was dotted all over with their crushed bodies.

In the open the moth is on the wing in July and sometimes in August. When kept indoors the caterpillars, or at least some of them, will feed up quickly and attain the moth state in September or October.

The species is distributed over the whole of Europe, except Andalusia, Sicily, and the southern part of the Balkan Peninsula, and its range extends through Asia to Amurland, Corea, and Japan.

The Cream-spot Tiger (*Arctia villica*).

Although this moth does not vary to the same extent as its cousin the Garden Tiger, it is still subject to considerable aberration in the size, number, and position of the yellowish-white, or cream-coloured spots on the fore wings and of the black spots and hind marginal markings of the hind wings. The former are often much reduced in size, rarely perhaps so greatly as to leave the fore wings almost entirely black ; but they are sometimes so greatly enlarged and united that these wings appear to be cream coloured with black markings. On

Pl. 84. **Garden Tiger** *varieties.* *M* 162.

Pl. 85.

Garden Tiger Moth.

Eggs, natural size and enlarged; caterpillars and chrysalis.

M 163

the hind wings the black spots nearest the base are sometimes widened and lengthened so as to meet and form a transverse band ; in other specimens the black markings on the outer area are run together into a patch. Occasionally both forms of hind wing aberration occur in the same specimen. I am not aware of any case in which the hind wings are spotless, but I have seen specimens in which this condition was very closely approached. Very rarely the hind wings are suffused with black, and at least two specimens with all the wings suffused with black have been recorded. (Plate 87, Figs. 1–3.)

The pearly white eggs are laid in neatly arranged batches on leaves. The caterpillars hatch out in July, feed for a few weeks, and go into hibernation while still small. They resume feeding in a favourable season as early as mid-March. Some that I obtained at the end of March, then about three parts grown, began to spin up on April 15. The full-grown caterpillar is black with several star-like clusters of brown hairs on each ring, the hairs on the back of the hinder rings rather longer and slightly curved backwards ; the head, legs, and claspers are red, approaching crimson. A diet of dandelion suits it very well, but it will also eat chickweed, dock, nettle, groundsel, and in fact almost any low-growing plant. The outer leaves of lettuce are useful on occasion but should not be given exclusively, and it also likes the tender shoots of gorse (*Ulex europæus*). Chrysalis and cocoon somewhat similar to those of the last species (Plate 86).

The moth emerges in May and June. Occasionally a few larvæ will feed up and the moths appear the same year, but this only happens in captivity and not in the open. When reposing in the daytime, on a hedgebank for example, with the fore wings closed down over and hiding the yellow hind wings this moth is not so conspicuous as one might suppose it would be. At night it is active on the wing and often flies into houses, attracted by the light. I have put up specimens now and then

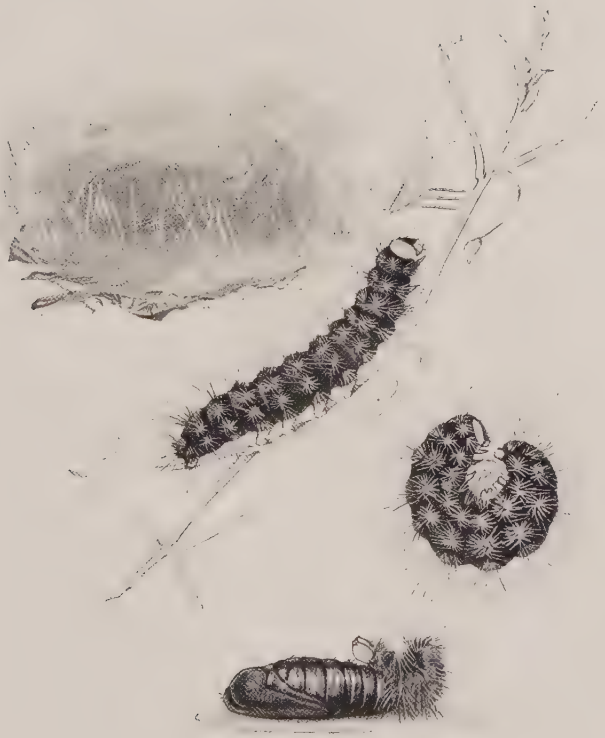
in hay fields, and once found half a dozen along a short stretch of the Upper cliff at Ventnor, Isle of Wight.

It is perhaps most frequent in the south-west, but the species seems to be widely distributed and fairly common from Kent to Cornwall, and westward from Hampshire to Gloucestershire. It also occurs in the eastern counties to Cambridge and Norfolk. From Cheshire it has been twice reported, and two specimens are said to have been taken, a few years ago, in the Lancaster district.

The Jersey Tiger (*Euplagia quadripunctaria*).

This handsome species long known as *E. hera*, Linn., but for which Poda's earlier name *quadripunctaria* must be adopted, has its English home in South Devonshire. The species had been recorded as British as far back as 1855, when one moth was taken at Newhaven in Sussex; in 1859 a specimen was obtained in North Wales, two were taken in Sussex, 1868, and one was captured in the Isle of Wight in 1877. The last-mentioned example was kindly presented to me by the captor, Mr. Rowland Brown. For the county of Devon, the earliest record is that of a specimen netted in a garden at Alphington, near Exeter, in 1871, followed soon after by a report of others at a place near Lodderwell. Ten or eleven years later the moth was found at Dawlish, and in that neighbourhood and in other parts of a wide area stretching from Exeter to Teignmouth, and perhaps further west, it has been taken almost every year up to the present time (1907). Large numbers of eggs have been obtained and distributed among entomologists, many of whom have successfully wintered the caterpillars and eventually reared the moths.

The principal variation is in the colour of the hind wings and the body, which usually are red, but in var. *lutescens*, Staud., are yellow; between the red and the yellow forms there are all



Pl. 86.

Cream-spot Tiger Moth.
Caterpillars, chrysalis and cocoon.

M 164.

Pl. 87.

1, 2. **Cream-spot Tiger Moth,** *males;* 3 *female.*

M 165.

kinds of orange and other intergrades. There is also variation in the black markings at the inner angle of the fore wings, some or all of which are sometimes absent. A specimen with the inner margin of the fore wings black instead of creamy-white has been recorded, and a specimen with whitish hind wings is stated to have been seen but not secured. The moth is shown on Plate 89, and the early stages on Plate 88.

The eggs, which are laid in batches, are pale yellowish when deposited, but assume a deep violet tint before hatching. Mr. W. Hewett (*Entom.* xxviii.) states that in the case of seventeen female moths that he captured in August, 1895, the average number of eggs laid by each was 133, and as regards fourteen batches of eggs, the caterpillars hatched out in fifteen or sixteen days.

When nearly full grown the caterpillar is blackish with an orange stripe along the back and a series of creamy white spots on the sides ; the hairs, arising from shining light brown warts, are pale brown mixed with greyish ones ; spiracles black ringed with white, under surface greyish. Head black and glossy. It hatches from the egg in the autumn and goes into hibernation while still very small ; reappearing in the spring and feeding on until July, when it spins a flimsy silken web-like cocoon well down among moss and litter. The food plants are dandelion, white deadnettle (*Lamium album*), ground ivy (*Nepeta glechoma*), groundsel, plantain, nettle, borage (*Borago officinalis*), and lettuce.

The moth emerges in July and August in a state of nature, but often as early as June in confinement. It sits by day among the herbage, and in the bushes of hedgerows, but readily quits its retreat when disturbed. The normal time of flight is at night ; and that light has an attraction for the moths is evident from the fact that they have been known to fly into cottages at the rate of three or four in an evening.

The species is distributed throughout Southern Europe, its

range extending to Holland, Belgium, and Livonia. It was known as an inhabitant of the Channel Islands long before it became established in England.

The Scarlet Tiger (*Panaxia dominula*).

Except in minor details this tropical-looking moth (Plate 89) seems little given to variation in England. In parts of Central and Southern Europe, and Asia Minor, striking forms occur, and some of these are very occasionally found with us. Among such rare aberrations in this country are var. *rossica*, Kol., with yellow hind wings; and var. *bithynica*, Staud., with the spots on the fore wings yellow, and the hind wings of the normal crimson colour. A South European form, var. *persona*, Hübn., has the hind wings and body black, with some yellow marks on the basal area; spots on the fore wings smaller than in the type. Specimens approaching this form have been reported from Kent, which county is also noted for "black *dominula*." In the latter variety the hind wings, body, and spots on fore wings are blackish; it is exceedingly rare. A specimen taken at St. Margaret's Bay, Kent, some years back has the spots on the fore wings blurred, due to a cloudy suffusion filling up the space between them; the spots on the hind wings are pale.

Caterpillar, black, hairy, with bands of more or less connected spots, yellow or yellowish in colour, down the middle of the back, and along the sides; the hairs, arising from shining black warts, are grey with some black ones intermixed. Head, glossy black. It hatches from the egg in July or August, feeds for awhile, then hibernates, and completes its growth in April or May. A number of plants have been mentioned as suitable food for these caterpillars, but the favourites are, perhaps, nettle, groundsel, hound's-tongue (*Cynoglossum officinale*), bramble, sloe, sallow, and comfrey (Plate 88).

Pl. 88. *M* 166.

1, 1*a*. **Jersey Tiger**: *caterpillars and chrysalis.*
2, 2*a*, 2*b*. **Scarlet Tiger**: *eggs, caterpillar, chrysalis and cccoon.*

Pl. 89.

1, 2. Scarlet Tiger Moth.
3, 4. Jersey Tiger Moth.

M 167.

The chrysalis is dark reddish, rather blacker above; enclosed in a silken cocoon spun up among leaves, etc., on the ground.

The moth emerges in June, and seems partial to marshy ground. It is found in the district between Dover and Deal commonly, and in other parts of Kent more rarely. Also in Hampshire, Devon, Dorset, South Wales, Gloucestershire, Wiltshire, Berkshire (water meadows by the Kennet), and Hertfordshire (rare). Some years ago I found a few specimens in the Brandon district, but it is not plentiful in Suffolk, and is rare in or absent from Norfolk. It was found in Cambridgeshire, chiefly in Wicken and Chippenham Fens, but not recently.

The Feathered Footman (*Coscinia striata*).

Altogether there do not appear to have been more than six or seven specimens of this species (Plate 90) recorded as British. Stephens mentions three of these, two males taken in the autumn of 1815, near Windsor; and one specimen, without date, in the Isle of Anglesea. Of the others one appears to have been taken in Yorkshire (1832), one in Essex, and another in North Wales (1859). Barrett also refers to a specimen, which was captured but afterwards escaped, near Bettws-y-Coed, North Wales, June, 1859, and gives some circumstantial details of the event. It appears, therefore, that of the very limited number of British *striata* North Wales has furnished almost half. The species is widely distributed in Europe, except the most northern part; the range extending into Asia Minor, Syria, Armenia, and Amurland. Abroad, it occurs on heaths, and in warm dry places. The caterpillar is blackish-brown,

marked with orange on the back, and white on the sides ; the warts are yellowish, and the hairs arising therefrom are reddish brown ; the head is black. It feeds in spring, after hibernation, on grasses, heather, and low herbage, and becomes full grown in May.

The Speckled Footman (*Coscinia cribraria*)

The fore wings are whitish, crossed by three rows of blackish grey dots, more or less connected, forming lines ; and two streaks of the same colour through the length of the wings, but not always extending to the outer margin ; a cross series of wedge-shaped marks or dots on the outer area ; hind wings grey. Sometimes the fore wings are wholly suffused with the darker colour, and between such specimens and less frequent examples in which the wings are almost devoid of marking, there are many gradations (Plate 90, Figs. 1 ♂, 2 ♀ ; 4, 5, 6 vars.).

Eggs received from the New Forest, June 25, 1907, were laid around a slender, bare, twig of heather, the batch measuring about three-quarters of an inch in length. At first they were golden yellow, but afterwards became pale purplish brown and very glossy (Plate 91).

Although the eggs appear to be more frequently laid on heather than on anything else, the caterpillars do not seem to be very partial to the plant as an article of food if others are available. At the present time (October 13) I have about a score or so of young larvæ feeding, and apparently thriving, on dandelion, lettuce, and grass, but they certainly seem to prefer the first named. They are now rather over half an inch in length, and yellowish brown in colour ; there is a whitish grey stripe along the back ; the warts are shining black, and the hairs arising from them are black, mixed with a few longer white ones ; head blackish.

Caterpillars after hibernation have been found on the grass,

Aira cæspitosa, during March from about the 10th onwards; they are then about a quarter of an inch long, and according to the late Mr. Fowler, always found on the sunny side of the clumps of *Aira* stretched out, and evidently enjoying the warmth of the sun. Some collected in that month were reared on groundsel, and produced moths from July 12 to August 20. The chrysalis is at first reddish, afterwards shining jet black; in a slight egg-shaped white silken cocoon, spun up in tufts of grass.

In exceptional seasons the moth has emerged in late May, but June and July are the usual months, and it may occur as late as August. It rests among the heather, is easily disturbed on sunny days, and is very active on the wing, although it does not fly far before settling again. The species is very local in England, and only found on a heath near Bournemouth, in a heathy district between Ringwood and Verwood in Dorset, and in a not generally known part of the New Forest.

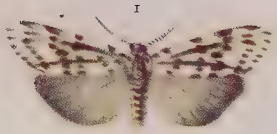
The Crimson Speckled (*Utetheisa pulchella*).

This white moth, prettily speckled with black and red dots, is a native of warmer countries than ours. However, it not only visits us now and then in the course of its wanderings, but if the migrants arrive in England at a suitable time of the year, the females most probably deposit eggs from which caterpillars may hatch, and some of them feed up and produce moths later in the same year. Stephens, writing in 1829, mentions a specimen taken many years previously in Yorkshire. This was no doubt the earliest known British example of Haworth's Crimson Speckled. A second specimen captured in a field near Christchurch, Hants, in October, 1818, was figured by Samouelle in 1819. Between the year last mentioned and 1827, two other specimens occurred, both at Hove, Sussex. Stainton (1857) adds Epping, Manchester, Stowmarket, and Worthing. In 1869

three specimens were taken in the autumn; and a specimen was found at Scarborough in June, 1870, and one in Sussex. In 1871 a record was established, when at least thirty specimens were obtained at various places on the east, south, and south-west coasts, and in the Isle of Wight; one specimen being also recorded from Manchester. Two specimens were taken in Cornwall, May, 1874, and in the autumn of that year three occurred on the south coast, and one in Derbyshire. The moth seems not to have been noticed in the springs of 1875 or 1876, but twenty-four specimens were recorded later in the former year, and twenty-three in the latter. Between 1876 and 1892 less than twenty specimens were reported altogether, and the species was either entirely absent or overlooked in 1877, 1882, 1883, and from 1887 to 1891, inclusive. In 1892 several moths were captured in May and June on the coast; one at Brighton in July, two in the Hastings' district, and one at Folkestone in August. Since 1892 and up to 1907, a period of fifteen years, the species seems to have been rarely noted in England; the records showing in 1894 (2), 1895 (1), 1906 (1). In 1901 three specimens were reported as captured, and one seen at Earlsfield, Surrey, July 1 to 15. (Plate 92, Figs. 3, 4.)

The caterpillar is greyish with black warts from which arise tufts of hairs, blackish on the back and pale greyish on the sides; a white line on the back, and one on the sides. Each ring is often barred with orange. Head reddish-ochreous marked with black. Feeds on forget-me-not (*Myosotis*), borage (*Borago*), etc. The chrysalis is reddish brown, enclosed in a white silken cocoon spun up among the food plant, or on the surface of the ground; in the latter case particles of earth adhere to the outside.

The caterpillar is said to feed only in the sunshine, so that in our islands the weather conditions would often be most unfavourable to the species in the larval state. On the other hand its sun-loving habit would expose it to the attacks of



Pl. 90.

M 170.

1 2. 4, 5, 6. Speckled Footman Moth.
3, Feathered Footman Moth.

Pl. 91. Speckled Footman : *eggs and caterpillar* *M* 171.

parasitical flies and other enemies. Anyway, the Crimson Speckled seems quite unable to increase and multiply to any extent even for a season in any part of England. Along the African and European borders of the Mediterranean there are evidently several generations of the moth in each year; the life cycle of the summer broods being short, but more protracted in the later brood. Brownlow states that eggs laid on October 20, hatched on the 22nd of the same month, and the caterpillar stage lasted until February of the following year. Distribution: Southern Europe, Africa, Canaries, Madeira; Asia Minor, Armenia, Central Asia; India, and Australia (see Appendix).

The Cinnabar (*Callimorpha jacobææ*).

This species was named the Cinnabar by Wilkes in 1773, such name of course referring to the more or less vermillion colour of the hind wings and the markings on the greyish black fore wings. The hind wings are often pinkish in tint, and probably it was to such specimens that Moses Harris gave the name "Pink Underwing." Very rarely the stripe on the front edge of the fore wings unites with the upper hind marginal spot; still less frequently there are some crimson scales in addition connecting the two hind marginal spots. Occasionally specimens have been recorded in which the usual red colour is replaced by bright yellow. The moth is shown on Plate 92, Figs. 1, 2, and the early stages on Plate 93, Fig. 1.

The caterpillar is orange yellow and each ring is banded with purplish black; the scanty hairs are short and blackish in colour. Head black. Feeds in July and August on ragwort (*Senecio jacobæa*) and sometimes occurs in such numbers as to completely clear large patches of the plant of every particle of green, leaving nothing but the tougher portions of the bare stems.

The chrysalis is dark-brown tinged with reddish; in a slight silken cocoon just under the surface of the ground, or among any loose material on the ground.

The moth is on the wing at the end of May and in June; odd specimens have occasionally been seen in April. It occurs on waste ground, sandy heaths, railway banks, downs, and hill-sides. Although fairly common generally, in some years it is not at all plentiful even when caterpillars may have abounded the previous season. When disturbed from among its food plant or herbage around, it is not very active on the wing, and is easily captured. Its usual time of flight is in the evening. Light seems to have an attraction for it, as it has been taken at gas lamps in towns, some distance from any place where the caterpillar could have fed.

FIG. 24.
Cinnabar Caterpillars Feeding.
(Photo by W. J. Lucas.)

Occurs in all suitable places throughout the greater part of England and in Scotland up to Moray. Common in Ireland.

Pl. 92. *M* 172

1. **Cinnabar Moth,** *male; 2 female.*
3. **Crimson Speckled Footman,** *male; 4 female.*
5. **Red-necked Footman,** *male; 6 female.*

Pl. 93. *M* 173.

1, 1*a*. Cinnabar: *caterpillar and chrysalis.*
2, 2*a*. Rednecked Footman: *caterbillar and chrysalis.*

Its range abroad includes all Europe, except the extreme north and extends into Asia.

Footman Moths (*Lithosiinæ*).

The members of this sub-family of Arctiidæ occurring in the British Isles are not numerous; we can only muster some fifteen species, and although a few are not uncommon, several are exceedingly local.

The moths of the genus *Lithosia*, when resting, fold their drab or buff-coloured wings down closely along the body, and they then have a very elongate and stiff appearance which probably gave rise to their English name "Footmen." Most of them are very inactive, or even torpid during the daytime. They repose on the branches and leaves of trees and bushes, or among heather and other low herbage, and often fall to the ground when disturbed. At dusk they become active and then fly pretty briskly.

The caterpillars are very hairy, the hairs arising in tufts from warts (tubercles) are usually short, but in some species are of moderate length. The majority hatch from the egg in the late summer, and do not complete their growth until the following year, about May or June. Some of them are known to be more or less active through the winter. In a state of nature most of the caterpillars feed on lichens growing on trees, bushes, rocks, or on the ground, but many kinds in confinement will thrive on a diet of lettuce or even withered leaves.

In all cases the chrysalides are enclosed in silken cocoons, and these are spun up among the lichens, in crevices of bark, or other suitable crannies.

The Red-necked Footman (*Atolmis rubricollis*).

When newly emerged from the chrysalis this moth is black on all the wings, but it soon loses its early velvety sheen and

becomes sooty in appearance ; the last rings are orange, but all the rest of the body is black ; the thorax also is black, but the part nearest the head, termed the collar, is red, hence the common English name Red-neck moth given to it by Harris (1778). Haworth called it the " Black Footman."

The caterpillar is greyish, more or less freckled with ochreous ; three lines along the back, the central one whitish, the others black and interrupted ; the hairs arising from reddish warts are brown or greyish brown. Head black. It feeds from July to October on lichens, chiefly those growing on fir and oak, but also on beech, and on old palings. Chrysalis, glossy dark red-brown in a tight-fitting cocoon of silk mixed with the hairs of the caterpillar ; spun up among the lichen. The moth is shown on Plate 92, Figs. 5, 6, and the caterpillar and chrysalis on Plate 93.

The moth is on the wing in June and July ; in forward seasons as early as the end of May. On a sunny afternoon it may be seen careering around trees, generally pretty high up. When resting the moths sit about on the trees or on the herbage under them. In some years it occurs in large numbers, but it is not usually very abundant, and sometimes even in its best localities only a few specimens will be seen during the season. It frequents woods, especially the larger ones, throughout the southern half of England up to Norfolk on the east, and Hereford on the west. In the northern counties it is rare, and is not common in Scotland or Ireland.

Abroad, its range is through Central and Northern Europe, except the extreme north, to Dalmatia, Altai, and Amurland.

The Muslin Footman (*Nudaria mundana*).

This delicate little moth has the semi-transparent fore wings pale greyish, faintly tinged with brown ; crossed by irregular brownish lines ; the hind wings are paler, shaded with a darker

Pl. 94. *M* 174.

1. **Crimson Speckled Footman:** *caterpillar.*
2, 2*a*. **Muslin Footman:** *caterpillar and chrysalis in cocoon.*
3, 3*a*. **Four-spotted Footman:** *caterpillar and chrysalis.*

Pl. 95. *M* 175.

1. **Round-winged Muslin Moth,** *male*; 4 *female.*
2. **Muslin Footman,** *male*; 6 *female.*
2, 5. **Rosy Footman.**
7. **Dew Moth,** *male*; 9 *female.*
8. **Four-dotted Footman,** *male*; 10 *female.*
11. **Four-spotted Footman,** *male*; 12 *female.*

tint on the outer margins. Occasionally all the wings have a smoky tinge. The moth is shown on Plate 95, Figs. 3, 6, and the caterpillar and chrysalis on Plate 94, Fig. 2.

The caterpillar is greyish, with a broad whitish or yellowish stripe along the back, divided down the centre and edged by blackish lines ; a velvety black mark on ring seven ; raised warts and hairs dark greyish. Head black, shining ; face yellowish. It may be found in April and May, after hibernation, on rocks, stone walls, especially those formed of loose cobbles or shale, trees, bushes, and even gate posts. I have beaten them from an old hawthorn hedge bordering a damp meadow in Middlesex, and collected them in numbers from the hollows of field boundary walls in North Devon. They feed on the tiny lichen that grows in such places as those indicated. The green, or yellowish-green chrysalis, is enclosed in a rather loose muslin-like silken cocoon, and is not difficult to obtain, especially from walls. It appears to be pretty generally distributed throughout England and Wales, except perhaps the midland and eastern counties ; it occurs in the east and west of Scotland. In Ireland it is common, and often abundant, locally.

Distribution : Northern and Central Europe.

The Round-winged Muslin (*Comacla senex*).

As indicated by Haworth's English name the wings of this moth are rounder in outline than those of the Muslin Footman, also named by Haworth. In general colour it agrees with that species, but it differs in having a larger central dot, and the cross lines are represented by blackish dots which, however, are not always well defined (Plate 95, Figs. 1, 4).

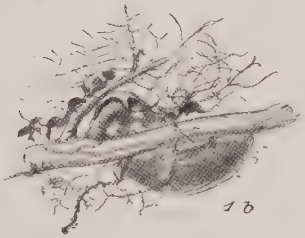
The caterpillar, as described by Buckler, is deep reddish-grey, thickly covered with hairs which are of two kinds ; the majority are pale brown with black points and slightly feathered, others are longer, black, and densely feathered with soft pale-brown

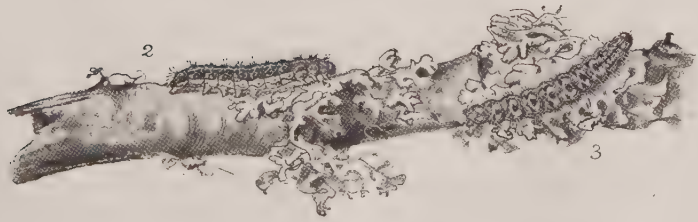
plumage. Head black and shining. It feeds in August and, after hibernation, in May on lichens and mosses growing on the ground in marshes and fens. It is known to eat *Peltigera canina*, and the mosses *Hypnum sericeum*, and *Weissia serrata*. Although occurring, in July and August, in marshy places in several parts of Southern England and Wales, it is especially common in fen land. In such localities as Wicken, for example, it flies at early dusk in hundreds all over the fen on favourable nights, but if there happens to be a breeze the moths will not leave their retreat among the herbage. Later on in the night, if on the wing, they readily assemble around a brightly burning lamp, and are satisfied to sit on the herbage illuminated by its rays. In Northern England it is known to be not uncommon in some districts of Yorkshire, and it probably occurs in other counties also. There appear to be only two records from Ireland and one from Scotland.

The Rosy Footman (*Miltochrista miniata*).

The fore wings of this pretty little moth are ochreous yellow tinged with pink; the front and hind margins are bright pink, in some cases approaching vermillion; the markings are bluish black; hind wings rather paler. It varies in the amount of black markings, which are sometimes almost absent, and in colour ranges from yellow to orange. (Plate 95, Figs. 2, 5.)

The caterpillar is dark drab covered above with blackish, mouse-coloured plumed hairs; on rings one and eleven the plumose hairs, are replaced by short simple ones; the hairs of the side tufts are plain. Head brown, the cheeks outlined in black (adapted from Hellins). Lichens growing upon the stems and branches of trees supply this caterpillar with food, and it seems to nibble on all favourable opportunities throughout the winter. It hatches from the egg in August, and is full grown in May, Boden, writing in September, 1896 (*The Entomologist*) noted





Pl. 96. *M* 176

1, 1*a*, 1*b*. Buff Footman : *caterpillar, chrysalis and cocoon.*
2. Common Footman : *caterpillar.*
3. Scarce Footman : *caterpillar.*

Pl. 97. N 177

1. Buff Footman, *male*; 2, 3 *females*.
5. Pale Footman.
7. Scarce Footman.
4. Dingy Footman.
6. Common Footman.
8. Northern Footman.

that some caterpillars had then attained the perfect state, while others were still feeding, and he adds that the caterpillars actually attacked and ate up the moths. Although there seems to be few records from the Midlands, this species appears to be widely distributed over England as far north as Yorkshire. In Ireland it has been recorded from Claring Bridge and East Galway. The moth is out in July. It is a wood-loving insect, but is also found on heaths, and even in lanes and the borders of fields when plenty of trees occur in such places. It may occasionally be beaten out of trees and bushes in the day time but it is on the wing at dusk, and although it is a high flier, specimens come within reach now and then. Light and sugar both attract it. The species ranges through Central and Northern Europe, and in Asia to Japan.

The Dew Moth (*Setina irrorella*).

Varies in colour from yellowish buff to creamy white, the colour on the margins always deeper; the rows of black spots on the fore wings are usually well defined, but sometimes those of the two central series are very faint, or quite absent, whilst an unusual number appear in the outer marginal series, Occasionally black scales appear on the veins, connecting the spots, and forming the figures ≷ more or less distinctly; such forms are known as var. *signata*, Borkh. The moth appears in June and July. (Plate 95, Figs. 7, 9.)

When resting, the moth hangs from a blade of grass, or leaf of some plant; it then has a very transparent appearance. Barrett suggests that this gave rise to the English name it now bears, and by which it was known to Haworth and entomologists of his time.

Buckler and Hellins describe the caterpillar as blackish-brown above, and dark-reddish grey or purplish grey on the sides; a series of yellow spots along the middle of the back, then a white

and yellow interrupted line, followed by a light yellow stripe under the spiracles; raised spots blackish, some white; hairs blackish brown. Head black.

It feeds, in the sunshine, on the black and yellow lichens growing in the haunts of the species, which are edges of cliffs and rough stony places near the sea, and also on hillsides. The species occurs, perhaps, more abundantly on the Kentish and Sussex coast than inland, but it is certainly not confined to the cliffs at Dover and Folkestone in Kent, or at Ventnor, Isle of Wight. Among inland localities for it are Box Hill, Ranmore, Reigate, and other places on the Surrey hills. It has also been recorded from the Cotswolds in Gloucestershire; the Isle of Man; St. Davids, South Wales; Aberdeenshire, Sutherlandshire, and the Tweed, Tay, Clyde, and Argyll districts in Scotland. For Ireland, Kane gives Mayo; "Ardrahan, County Galway, and west through the Burren of Clare, widely spread."

The Four-dotted Footman (*Cybosia mesomella*).

Fore wings pale creamy white, the margins yellowish: a black dot near the costa, and another below near the inner margin; hind wings suffused with blackish grey. Rarely the fore wings are yellow with a whitish central shade, and the hind wings are yellowish. (Plate 95, Figs. 8, 10.)

The caterpillar is velvety blackish grey; warts thickly set with densely feathered blackish hairs. Feeds in April and May, after hibernation, on lichens growing among heather. In confinement it will, according to Buckler, eat heather and fresh or withered leaves of sallow.

Fairly well distributed over England. It appears to be absent from Ireland, but in Scotland it is known to occur in the Clyde, Solway, and Moray districts, and has been recorded from Aberdeenshire. In the South of England it affects heaths and the more open woods; sometimes not uncommon in

such places. The moth, in June, may be disturbed from bushes, or put up from the heather as one walks through. As the sun goes down it may often be seen on the wing, but later in the evening is its chief time of activity. In Lancashire and Cheshire it is found on the mosses, and Cannock Chase in Staffordshire is a noted locality for it. Still obtained in Chippenham, Wicken, and other Cambridgeshire Fens, also at Wood Walton Fen, Hunts.

The Four-spotted Footman (*Lithosia quadra*).

The sexes of this species are very different in appearance. The fore wings of the male are grey tinged with yellowish, except on the outer fourth; the basal fourth is yellow. The female is larger and yellow in colour; each fore wing has two black spots, sometimes unusually large, sometimes mere dots, and more rarely absent altogether. (Plate 95, Figs. 11, 12.)

Caterpillar blackish with four wavy yellow lines along the back, the spaces between the lines powdered and freckled with yellow giving a grey appearance; raised spots on the back red, those on the sides greyish; a black cross on rings three, seven, and eleven; hairs grey mixed with black. Head black and glossy. It feeds, after hibernation, in May and June, on lichens, preferring those upon oak trees. In the breeding cage it is apt to eat its companions, especially when many are crowded into a small receptacle. (Plate 94, Fig. 3.)

The moth emerges in July, and during that month, and sometimes in August, it may be seen on tree trunks; but it more often reposes on the branches, from which it may be dislodged by jarring the boughs with a stick, when it drops rather than flies towards the ground, but generally manages to arrest its downward course by catching hold of a spray of bracken or some other plant and there awaits capture. Night is the usual

time of flight, but it is on the wing at dusk. It is partial to "sugar" and has been known to visit flowers.

This species has been recorded from a large number of localities in England extending from the Scilly Isles to the Scottish border. From the circumstances connected with many of such captures one is led to suspect that the insect has migratory habits. In England the most favoured locality is the New Forest in Hampshire, where it abounds in some seasons, but is quite scarce in others. It occurs, more or less regularly, in the larger woods in Dorset, extending into Devon ; also in Sussex ranging into Kent, but is only occasionally common in either of these counties. Generally considered to be uncommon in the eastern counties, but has been reported to occur in large numbers at Aldeburgh in Suffolk. The localities given in Kane's catalogue of the Lepidoptera of Ireland are Killarney, Timoleague, Co. Cork, Curraghmore (abundant), Lismore, Borris, Co. Carlow, and Clonbrock. To these may be added Dublin, and Nenagh ; common at Ummera and Kenmare.

Distribution : Central Europe, Southern Sweden, Livonia, Dalmatia, Armenia, Amurland, Corea, and Japan.

The Buff Footman (*Eilema deplana*).

Fore wings, ochreous grey, tinged with yellow on the basal half of the front margins ; hind wings paler, becoming greyer on the outer area ; fringes of all the wings yellow. The male is fairly constant in colour, but the female sometimes has a distinct yellow stripe on the front margin of the fore wings extending to the fringes (var. *ochreola*, Hübn.) ; more rarely in the New Forest, Dorset, and S.W. Ireland, a form occurs with the fore wings orange buff, and the hind wings only slightly tinged with grey (var. *unicolor*, Bankes). (Plate 97, Figs. 1–3.)

Caterpillar, greyish, or greenish grey, freckled with darker, hairs grey inclining to brownish ; a broad creamy or yellowish

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SWANLEY. KENT.

Pl. 98.

N 180.

1, 1*a*. Hoary Footman: *caterpillar and chrysalis.*
2. Dingy Footman: *caterpillar.*
3. Dotted Footman: *caterpillar.*

Pl. 99. N 181.

1, 2. **Hoary Footman.**
5. **Dotted Footman.**
3, 4. **Pigmy Footman.**
6, 7. **Orange Footman.**

stripe, edged with black and traversed by a dark central line along the back. Head blackish and glossy. From August to June on lichens growing on stems and branches of yew, oak, and beech.

A local species, and although recorded now and then from several other parts of the country, and also from Killarney in Ireland, seems to be pretty much confined to the counties of Surrey, Sussex, Hants, Dorset, and Devon. The moth, which is out in July, rests during the day upon the boughs and among the foliage of oak, beech, and yew, the latter especially in the Dorking district of Surrey.

Distribution: Central Europe, Southern Scandinavia, Livonia, Northern Italy, Roumelia, and Russia.

The Dingy Footman (*Eilema griseola*).

Haworth's English name for this moth was the "Dun Footman." In its typical form the fore wings are pale greyish with a yellowish front edging; the latter most distinct towards the base; the hind wings are whitish ochreous more or less suffused with grey. The pale form, var. *flava*, Haw. = *stramineola*, Doubl. at one time considered a distinct species (the Straw-coloured Footman of Haworth), has pale straw-coloured fore wings and white ochreous hind wings. (Plate 97, Figs. 4, 5.)

Caterpillar, sooty brown, with a darker line down the middle of the back and an interrupted yellow or orange line or stripe on each side of it; dark brown hairs arising from dark warts; head glossy black (described from a skin). It may be looked for in the spring months on the lichens affecting alders and sallows growing in fens and marshy places. (Plate 98, Fig. 2.)

The moth is abundant in the Cambridge and Norfolk fens, and is common in boggy places in the New Forest, but it probably occurs in all suitable places throughout England and Wales. It does not seem to have been observed in Ireland,

but has been recorded from Moray in Scotland. The yellow variety, which by the way is not known to occur abroad, is found, with the ordinary form, chiefly in the Norfolk fens and in the New Forest ; but it is also to be obtained, though less frequently, in Surrey (Weybridge district), Berkshire (Reading district), and still more rarely elsewhere. It is out in July.

Distribution : Central Europe, South Russia, Ural, Altai, Amurland, Corea, Japan, and West Africa.

The Common Footman (*Eilema lurideola*).

Fore wings, leaden grey with a yellow stripe terminating in a point at the tip of the wing ; the hind wings are pale ochreous yellow. It appears in July, sometimes at the end of June.

Caterpillar, dark greyish covered with blackish hairs arising from black warts on the back, and yellowish hairs from similar coloured warts on the sides ; three black or blackish lines on the back, and an orange stripe along the sides from the fourth to eleventh rings ; head black. August to June. Generally supposed to feed, in a state of nature, on lichen growing on trees and bushes. It has been reared on the foliage of sallow, apple, and oak ; also known to eat buckthorn, clematis, dogwood, etc. I have occasionally beaten it from old hedgerows, and have frequently seen it on trunks of poplar and ash upon which not much in the way of lichen could be seen. Such caterpillars, when taken, have almost invariably spun up soon afterwards. The moth is shown on Plate 97, Fig. 6, and the early stages on Plate 96, Fig. 2.

This species is perhaps the commonest and most generally distributed member of the genus in England. It becomes much less frequent in northern parts of Lancashire, and in Yorkshire it is local, but recorded as common in the south-east of that county. It occurs in Scotland, whence it has been recorded from Clydesdale, Aberdeenshire, and Moray. Kane

states that it is common near Galway, and also gives Castle Bellingham, Clogher Head (not rare), and Athlone as Irish localities. Recently reported common in Clare (Donovan).

Distributed over Europe, except the extreme north, Andalusia and Southern Italy; the range extending to Asia Minor and Armenia. In Amurland, Corea, and Japan, it is represented by *coreana*, Leech.

The Scarce Footman (*Eilema complana*).

Very similar in appearance to the last species, the yellow stripe along the front edge of the fore wings, however, does not terminate in a point, but is continued through to the fringes; the hind wings are sometimes distinctly yellow, and with but little, if any, greyish shading on the front area. (Plate 97, Fig. 7.)

Caterpillar, brown or brownish grey above, and paler beneath; a white-edged black line along the middle of the back, and a row of orange spots, alternating with whitish ones, on each side of the line; the orange spots faint or absent on rings one to three; an interrupted yellow or orange stripe along the sides; the brownish warts are thickly studded with short greyish brown hairs. Head black and glossy (described from a skin). From August to June. The most usual food is probably lichens on trees, but it is said to eat moss, knot-grass, clover, and the flowers of bird's-foot trefoil, etc. (Plate 96, Fig. 3.)

The moth is out in July and part of August, and may be disturbed in the daytime from its resting-place among heather and low herbage. It is on the wing in the dusk of the evening, and when the weather is favourable, flies freely. As it has a weakness for sweets, it should be looked for at night, by the aid of a lantern, on the flowers of knapweed and thistle. It chiefly affects heaths, but it is also found in woods, and on sandhills by the sea, as in Norfolk. A local species, but usually to be more or less frequently met with in all the eastern

and southern counties, and in some of the midland. Rare in Wales, Cheshire, Lancashire, and York. Only doubtfully recorded from Scotland. In Ireland it is widely distributed, and, according to Kane, not uncommon where it occurs.

The Northern Footman (*Eilema sericea*).

Gregson named and described this insect in 1860, and in the following year Guenée described it as *L. molybdeola*. It seems to be peculiar to England, and only occurs on the mosses of Lancashire and Cheshire. The fore wings are somewhat narrower and darker in colour than those of the Scarce Footman ; and the hind wings are suffused, to a greater or lesser extent, with dark grey. Some entomologists maintain that this is probably only a small form of *E. complana*. According to Mr. Pierce it cannot be specifically separated from that species or from *E. pygmæola* by the genitalia, the usual test in such matters. Prout, however, has stated that Speyer, in 1867, pointed out structural differences, not only in the shape of the wings, but also in the size of the costal tuft of scales on the underside of the fore wings. It should be added that there does not seem to be any material difference between the caterpillar of *complana* and that of *sericea*. Anyway, the question of form or species may here be left open. The fact of the Northern, or Gregson's, Footman being an exclusive British production invests the insect with an importance greatly above that attaching to the majority of our moths. The moth is depicted on Plate 97, Fig. 8.

The Pigmy Footman (*Eilema pygmæola*).

Ochreous white, sometimes tinged with greyish, or with yellowish ; hind wings clouded with greyish on the front area. Female almost always smaller than the male. The fore wings

vary a good deal in the matter of colour, the extremes being yellow and dark grey. (Plate 99, Figs. 3, 4.)

Buckler describes the caterpillar as brown on the back, with a central thick black line, and two dark brown lines; sides paler brown, with a dusty white line along the spiracles; the warts (tubercles) with short brown hairs, and the head black. August to June.

This extremely local little moth was unknown as an inhabitant of Britain until 1847, when it was described as *L. pygmæola*, by Doubleday in the *Zoologist* for that year, and noted as having been found among rushes on the coast of Kent. Two years later the insect was again referred to, and it was then stated to be confined to a "space of about four hundred yards in extent, on the coast of Deal." It then became known as the "Deal Footman." During the past seventy years or so large numbers have no doubt been removed from this locality, which is the only British one it was known to occur in. It is still to be found there, although said to be less common than formerly. In the *Entomologist* for September, 1912, this species was recorded as not uncommon on marram grass growing on the Norfolk coast. It has also been recorded from S.E. Kent.

The moth is a distinct species, and should not be confused with *lutarella*, which is found throughout Central and Eastern Europe; ranging to South Scandinavia, Finland, and eastward to Siberia and Amurland. The species has also been obtained in Holland.

The Hoary Footman (*Eilema caniola*).

Fore wings silky whitish grey with a yellowish streak along the front edge; the hind wings are whitish with a faint yellowish tinge. Some of the specimens are entirely whitish (var. *lacteola*, Boisd.). July and August, sometimes earlier. (Plate 99, Figs. 1, 2.)

Caterpillar greyish brown, with a black line along the back, and a series of irregular orange marks, representing stripes, on each side of it; these orange marks are outwardly edged with black; an orange line low down along the sides; warts greyish or brownish, each bearing a tuft of short pale hairs. Head blackish, shining, notched on the crown, and studded with pale bristles in front. Fed on lettuce from April 30, the date they were received from Mr. Walker of Torquay. They were then quite small, the largest not more than half an inch in length. They pupated in June, and the moths emerged in July, all fine specimens. (Plate 98, Fig. 1.)

In the open the caterpillar feeds upon the black lichens growing on rocks, etc., by the sea; also upon Dutch clover (*Trifolium repens*), kidney vetch (*Anthyllis vulneraria*), and bird's-foot trefoil (*Lotus corniculatus*).

This species was not known to occur in any part of the British Isles until August, 1861, when the late Mr. C. G. Barrett took four specimens on the Hill of Howth in Ireland (*vide Ent. Annual*, 1862, p. 106). A large number were subsequently captured or reared from caterpillars obtained in the same locality by others. Kane ("Cat. Lep. Ireland") remarks that the colony flourished at Howth for many years, but that the species seemingly perished in the severe winters of 1878 or 1879, and unless a specimen taken in 1890 was this species, has not since been seen there. The only other Irish locality from which it has been recorded (August, 1866) is on the coast near Waterford. Torquay, where the species was first observed in 1864 is now a noted locality, and it is said to occur in certain spots along the coast to Babbicombe. Other localities in Devon are Dartmouth, Torcross, and Bolt Head. Barrett found the species rarely in two places by the sea in South Pembrokeshire, and mentions Rye in Sussex, and Romney Marsh in Kent. Recently reported from Cornwall.

Mr. J. Walker informs me that the moths fly at dusk, and

that they all seem to get active at almost the same moment, and settle again in the same way at the end of their first flight, which lasts about half an hour. After dark the rays of an acetylene lamp directed downwards into the bushes will attract them from their retreat. Occasionally they visit "sugar."

Abroad this is a southern species, but its range extends to Western Germany, the Tyrol, Switzerland, and South Hungary, as well as to England ; also to Asia Minor.

The Orange Footman (*Eilema sororcula*).

This moth is orange yellow on the fore wings, and a paler shade of the same colour on the hind wings. Except that the tint is brighter in some specimens and darker in others, there is nothing to mention in the way of aberration. (Plate 99, Figs. 6, 7.)

The caterpillar is white on the back with five black stripes, the outer ones broader than the others ; all these stripes are broken up by brownish patches, and they fail to show at all on the eighth ring, which, therefore, is conspicuously white ; the sides are smoky grey marked with white on the second and third rings ; the warts are reddish, bearing smoky grey hairs. It may be found from July to September on the lichens growing on the trunks of oak trees. The moth does not appear until the following May or June, when it may be beaten from branches. Not uncommon in the woods, chiefly oak, of Norfolk, Suffolk, Essex, Kent, Surrey, Hampshire, and Dorset ; it also occurs in Cambridgeshire and Sussex. In Berkshire and Bucks it is fairly common, but seems to affect the beech woods in those counties. Recorded from Ireland by Birchall, who stated that it was abundant at Killarney. Donovan doubts this record.

The Dotted Footman (*Pelosia muscerda*).

The fore wings are pale grey suffused with pale reddish-brown except on the costal area : there are six black dots, two

before the middle of the wing and placed above the inner margin, and four beyond the middle in an oblique series from the costa; the hind wings are pale brownish-grey, becoming somewhat darker towards the apex. (Plate 99, Fig. 5.)

Caterpillar velvety blackish-brown, marbled with reddish-grey; stripe along middle of the back, and a line on each side of it deep black; warts and hairs brown, the latter short but numerous; a pair of red spots on ring one, and another pair on ring twelve; beneath the spiracles is a fine reddish-grey line; under surface pinkish grey; head small and blackish (Buckler). So far it has escaped detection in its fenny home, but it has been reared from eggs laid by a captured female. Caterpillars obtained in this way seem to have thrived on a mixed diet of lichens, mosses, and withered leaves of bramble and sallow. August to May. Buckler states that the dark chestnut-brown pupa is enclosed in a double cocoon, the inner a webby one of greyish silk, and the outer one thinner and composed of white silk. The whole affair was formed in a curled-up bramble leaf. The caterpillar is figured on Plate 98, Fig. 5.

The moth is out in late July and through August. It has been obtained in a certain marshy locality in the New Forest, Hants, and also in some marshes at Sandwich, Kent. Its chief haunts are, however, in the fens of Norfolk, such as those on the river Bure, and Brundall fen on the Yare, but Horning and Ranworth are, perhaps, the headquarters of the species. It may be mentioned that when Stephens wrote about this insect in 1829 only two specimens had then occurred in Britain, and these had been found in a marsh at Horning floating upon the water in a ditch.

Distribution: Central Europe, Denmark, Sweden, Livonia, Dalmatia, Corsica and Sardinia, Amurland and Japan.

Pl. 100. *N* 188.

1. **Scarce Merveille du Jour.**
2. **Nut-tree Tussock.**
3, 4. **Miller Moth.**
5. **Sycamore Moth.**
6. **Poplar Grey.**
7. **Marsh Dagger.**
8, 9. **Alder Moth.**
10. **Dark Dagger.**
11. **Grey Dagger.**

Pl. 101. *N* 189.

1. **Poplar Grey:** *caterpillar.*
2, 2*a*. **Scarce Merveille du Jour:** *caterpillar and chrysalis.*
3, 3*a*, 3*b*. **Nut-tree Tussock:** *caterpillar, chrysalis and cocoon.*
4. **Dark Dagger:** *caterpillar.* 5, 5*a*. **Grey Dagger:** *caterpillar and chrysalis*

AGROTIDÆ.

This extensive assemblage of moths, commonly known as noctuas, and locally as "millers," "owlets," and "buzzards," has been divided by Hampson (whose classification is here adopted) into thirteen sub-families, of which the following eleven are represented in the British fauna :—Agrotinæ, Hadeninæ, Cuculliinæ, Acronictinæ, Eustrotiinæ, Sarrothripinæ, Westermanniinæ, Catocalinæ, Plusiinæ, Ophiderinæ, and Hypeninæ.

The eggs of species in this family are round and somewhat flattened in shape, and the shell is fluted or netted. Some few examples of these have been figured.

Most of the larvæ conceal themselves during the day, in the ground, among low herbage, or in spun-together leaves, and only leave their retreat at night to feed. Most kinds change to the chrysalis state underground, but some pupate among leaves or in chinks of tree bark, etc.

With some few exceptions the moths fly only at night, by far the larger number will visit the sugar patch, and others come readily to flowers or to light.

Distribution abroad will only be referred to where this is restricted in Europe, or extends far beyond European limits.

ACRONICTINÆ.

The Scarce Merveille du Jour (*Moma alpium*).

This pretty moth has the fore wings green variegated with white stripes and black cross lines ; the hind wings are greyish, marked with white at the anal angle. The spaces between the interrupted cross lines of the fore wings are often marked with

black, and this is the typical form of the species ; the plainer specimens —those less spotted with black—being referable to var. *runica*, Stephens. Stephens in 1829 notes that the species was then little known in England. It is still very local, inhabiting oak woods in Sussex (Hailsham), Hampshire (New Forest, sometimes common), Devonshire (Plymouth district), Cornwall (East Looe), Essex (Colchester), and Suffolk (Ipswich). The moth is out in June ; on September 5, 1906, Mr. L. W. Newman bred a small specimen that had only been in the chrysalis seventeen days. Usually it rests by day on boughs, and sometimes on the trunks of trees (see Fig. 8, p. 9) ; it flies at night and then patronizes the sugar patch, but often is a late visitor. The caterpillar, which feeds upon oak in July and August, is black on the back with a yellow or whitish blotch on rings four, six, and nine ; the reddish warts are crowned with tufts of brown or whitish hairs. Head black marked with yellow except on the top. It is also said to eat leaves of beech and birch.

Distribution : Central and Northern Europe, and represented by var. *murrhina*, Graes., in Amurland, China, and Japan.

The moth is depicted on Plate 100, Fig. 1, and the caterpillar and chrysalis on Plate 101, Figs. 2, 2*a*.

The Nut-tree Tussock (*Colocasia coryli*).

Usually the fore wings of this moth appear to be brownish, or reddish brown on the basal half, and whitish, more or less suffused with greyish, or sometimes reddish brown, on the outer half ; the hind wings are pale brownish, or greyish, lighter towards the base. Not infrequently the fore wings are greyish white with some brownish clouding between the two blackish cross lines. The caterpillar is variable in colour, but generally of some shade of brown, ranging from dark chocolate brown to

pale ochreous, covered with soft hair ; the pencils of long hairs on the first ring, and the tufts of hairs on rings four, five, and eleven, may be red, greyish, or blackish ; the broken stripe along the back is greyish, and the stripe low down on each side may be red, brown, or greyish. It feeds in June and July, and as a second generation in September, on the foliage of beech, birch, hazel, hornbeam, etc. : bushes growing in exposed positions such as a hedge bank or hill side are chiefly fancied. The moth flies in May and June, and again in August and September. It probably occurs in most of the English counties, but is most frequent in Berkshire, Bucks, and Devon. Not uncommon in Clydesdale, but more plentiful in Aberdeenshire, and is also obtained in Perthshire, and in other parts of Scotland. Widely distributed in Ireland.

The moth is shown on Plate 100, Fig. 2, and the early stages on Plate 101, Figs. 3, 3*a*, 3*b*.

The Miller (*Apatele leporina*).

In its typical form the wings are quite white with but little in the way of marking. Most, if not all, the specimens occurring in Britain are the more or less greyish suffused and more marked, variety known as *bradyporina*, Treits. (Plate 100, Figs. 3 ♂, 4 ♀.) Sometimes the outer margins of the fore wings, beyond the second cross line, are shaded or dusted with blackish (var. *semivirga*, Tutt). In the Liverpool district a form is occasionally obtained in which the fore wings are darkly suffused, and the thorax is black (var. *melanocephala*, Mansbridge). A specimen with black fore wings and white fringes has been bred from a caterpillar found in Essex (*Entomologist*, xxxviii., 289, and xxxix., 97).

The caterpillar is pale green clothed with long white, and a few black hairs ; these fall downwards, and on the one side curve forwards, and on the other side backwards. Sometimes in the

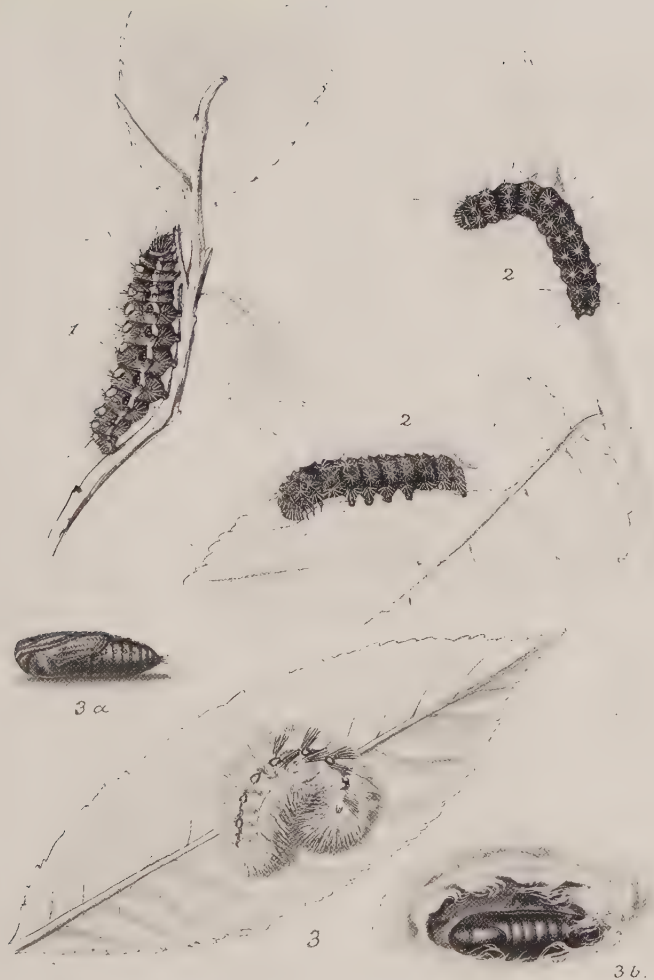
south of England, more frequently in the north, the ground colour and hairs are yellow, and there are more or less distinct reddish brown bands on the back and sides. It may be found from July to September, or even later, on birch or alder, rarely on oak and poplar. The moth occurs in May and June, as a rule. In 1904 I took a freshly emerged specimen on July 23, at Byfleet in Surrey, and some half-grown caterpillars were obtained on the same day, and very near the same spot. The species is found in woods, and on heaths and mosses, where birch or alder flourishes, from Devonshire in England to Sutherlandshire in Scotland. It is not common anywhere in our islands, but is perhaps most frequently met with in the south and east of England. In Ireland it appears to have been found only in the southern counties.

The Sycamore (*Apatele aceris*).

The dark mottled grey moth on Plate 100, Fig. 5, is not much given to variation, but occasionally brownish suffused forms occur (var. *candelisequa*, Esp. = *infuscata*, Haworth).

The caterpillar (Plate 102, Fig. 3) feeds in August and September upon sycamore, maple, and sometimes plum and chestnut. It has some black-edged white marks along the middle of the back; the pointed tufts of long hairs are yellow or reddish. When it is at rest on the underside of a leaf, or coils in a ring on being disturbed, the hair tufts gave the creature a somewhat prickly appearance. The moth is out in June and July.

The species is more or less common pretty well through the southern and eastern counties, and fairly so in and around London. Its range extends to Warwickshire and Herefordshire; but it is scarce in both counties. The Irish localities for it are Claring Bridge and Ahascragh, Co. Galway; Glandore, Co. Cork; and Enniskillen, Co. Fermanagh.



Pl. 102. *N* 192.

1. **Knot Grass:** *caterpillar.*
2. **Scarce Dagger:** *caterpillars.*

3, 3*a*, 3*b*. **Sycamore:** *caterpillar, chrysalis and cocoon.*

Pl. 103. *O* 193.

1. 2. **Light Knot-grass.** 3. **Scarce Dagger.** 4. **Sweet Gale Moth.**
5. **Coronet Moth.** 6. 7. **Knot-grass Moth.** 8. **Marbled Green,** *male ;* 11, *female.*
9. **Marbled Beauty.** *male ;* 12 *female.* 10. **Powdered Wainscot.**

The Poplar Grey (*Apatele megacephala*).

This moth is somewhat like that last noticed, but the fore wings are darker grey; the whitish orbicular mark is margined with black, and has a dark central dot. Sometimes the fore wings are clouded with blackish, and occasionally entirely suffused with black. In several species of *Apatele* newly disclosed specimens have a faint pinky tinge, but this is especially noticeable in the present species. (Plate 100, Fig. 6.)

The caterpillar is ochreous or grey brown, marked with blackish; a conspicuous character is a black-edged whitish or ochreous patch on ring ten; the hairs are whitish, those on the sides rather long. It feeds from July to September on the foliage of poplars. (Plate 101, Fig. 1).

This well-known cockney species is on the wing from late May to mid-August. Has been bred in September from a caterpillar taken in July, also in October from August larvæ. It is often abundant on poplars (especially the caterpillars) in London and suburbs. Common all over the southern parts of England, except perhaps in Devon and Cornwall; its range extends through Northern England to Ross in Scotland; and it is found in the south of Ireland.

The Alder (*Apatele alni*).

The sexes of this black-clouded grey moth are shown on Plate 100, Figs. 8 and 9 ♀. Except that the black clouding sometimes spreads over a greater area of the fore wings, there is little to note in aberration, at least in a general way. In 1906 a melanic specimen was bred from a chrysalis taken from alder in Delamere Forest, Cheshire; this is probably referable to var. *steinerti*, Caspari.

The caterpillar (Fig. 26) is black, marked with yellow; the

curious clubbed hairs are its distinguishing feature. Although named after the alder, it feeds on the leaves of most trees and bushes in July and August, sometimes earlier or later. The moth is out in May and June, but although an occasional specimen has been taken at sugar or light, once resting on nettles, it is rarely met with. Caterpillars also are not by any means common, and any one who may obtain even a single example in a season may congratulate himself on a good find. They are perhaps most frequent in the Hampshire (New Forest) district and some of the Sussex woodlands, but have occurred now and then in almost every county of England up to Yorkshire; also in Glamorganshire, Carmarthenshire, and at Trefriw in Wales. In Ireland recorded from the south only. The range abroad extends to Armenia, Amurland, and Japan.

FIG. 26.
Caterpillar of the Alder-Moth.
(Photo by W. J. Lucas.)

The Marsh Dagger (*Apatele strigosa*)

This little moth, known also as the "Grisette," seems confined, as a British species, to the country around Cambridge; but it has been twice recorded from Norfolk, two specimens have been reported from Worcestershire, and one from Gloucestershire; the latter at sugar in June, 1897. The latest records that I have seen refer to a moth taken at sugar near Chatteris

in 1904, two caterpillars beaten out of hawthorn in August, 1905, and a moth on an ash tree, Wicken, July 31, 1907. South Cambridgeshire, 1933. (Plate 100, Fig. 7.)

The caterpillar is yellowish green, with a red brown stripe along the back; two small elevations on ring four, and one on ring eleven; the hairs are blackish on the back, one of each tuft longer than the others. It feeds on hawthorn in August and early September. The moth is out in July. This species is found abroad in Central Europe and Southern France; also in Amurland, Corea, and Japan.

The Dark Dagger (*Apatele tridens*).

The English name of this moth is not very suitable, as in general colour it is often really paler than many examples of the next species. Specimens with a blackish cloud at the base, and a dark band-like suffusion on the outer margin of the fore wings are referable to var. *virga*, Tutt. It is widely distributed in England and Wales, but apparently not common; rare in Scotland and in Ireland. I am unable to indicate any character that will serve to distinguish this moth from the Grey Dagger. The moth flies in June; a second brood sometimes occurs in confinement in October. The caterpillars of the two species are very distinct. That of the present species is black, with a broad reddish stripe along the back, and one on each side; the first is interrupted with white, and the others with black; there is a black hump on the fourth ring, and a broader one on the eleventh ring. It feeds from August to October on hawthorn, sloe, plum, pear, and apple; also on birch and sallow.

The moth is shown on Plate 100, Fig. 10; and the caterpillar on Plate 101, Fig. 4. (See also Appendix.)

The Grey Dagger (*Apatele psi*).

The ground colour varies from whitish to blackish grey. Var. *bivirgæ*, Tutt, is similar to var. *virga* of the last species.

In var. *bidens*, Chapman, the first cross line is double, enclosing a pale stripe; the upper part of second cross line is more angled, and the dagger mark at the anal angle is much shortened.

The caterpillar has a taller and more slender hump on ring four, and the stripe along the back is clear yellow, with black edged red spots on each side of it. Generally distributed, and often common.

The moth is shown on Plate 100, Fig. 11; and the caterpillar and chrysalis on Plate 101, Figs. 5 and 5*a*. (See also Appendix.)

The Light Knot Grass (*Apatele menyanthidis*).

Portraits of this moth will be found on Plate 103, Figs. 1 ♂, 2 ♀. Several modifications have been named, the most important of these are var. *scotica*, Tutt, which is larger and brighter than the type, with the markings clear and distinct; var. *suffusa*, Tutt, is much suffused with black. The former is chiefly found in Scotland, and the latter in Yorkshire.

The caterpillar is black or sooty-brown, with a red stripe, or blotches, low down along the sides; hairs black or red-brown. In August and September feeding by day on sweet-gale or bog myrtle (*Myrica gale*), bilberry, heather, dwarf sallow, etc. The moth flies in June and July, and may be found on the mosses and moorlands of North England and Scotland. It rests by day on rocks, stones, and, where they are handy, on posts and rails. I found several on Danes Moss, Cheshire, sitting on a derelict tub. Also occurring in Ireland, but not common.

The Scarce Dagger (*Apatele auricoma*).

The pale grey, darker-mottled moth depicted on Plate 103, Fig. 3, is very local, and only occurs in some of the woods o

Kent and Sussex; the districts mentioned being those of Rochester, Canterbury, Hailsham, Tilgate, and Hastings.

The caterpillar is figured on Plate 102, Fig. 2. It is slaty grey in colour with a black plate on the first ring; on the back of each ring is a broad black band, and four orange warts from which arise golden-yellow silky hairs; the hairs on the sides are pale drab (adapted from Buckler). It feeds in June and early July, sometimes in September, on oak, birch, various kinds of *Rubus*, such as blackberry and raspberry, and also on bilberry (*Vaccinium*). The moth is out in late April and in May; occasionally late July and in August. It is rarely seen in the day time, but has been found resting on tree trunks. The range abroad extends to Southern Russia and Siberia.

The Sweet-Gale Moth (*Apatele euphorbiæ* var. *myricæ*).

Our form of this species—var. *myricæ*, Guenée (Plate 103, Fig. 4), is rather larger and much darker than the type; but although it is generally somewhat smaller than the Alpine var. *montivaga*, Guenée, it is not otherwise separable from that form. So far as concerns the British Isles, it is only found in Scotland and, rarely, in Ireland. It was first obtained in Perthshire, in 1846, by Weaver, and it is now known to occur more or less commonly through Scotland from Ayr to Sutherlandshire. In Ireland it occurs in Cork, Kerry, Galway, and Sligo, and Kane considers that specimens from Markrea, and Lough Gill in the latter county are referable rather to var. *montivaga*, than to var. *myricæ*. The moth is out in April, May, and June.

The dark greyish caterpillar has a deep black, broken, stripe along the middle of the back, and a series of pale yellow marks on each side of it; along the black-margined white spiracles there is a reddish orange line, or broken stripe; pale brownish hairs arising from yellowish warts on the back, and a cross-bar of reddish orange near the head. It feeds on sweet

gale, heather, birch, sallow, etc., and may be found from July to September.

The Knot Grass (*Apatele rumicis*).

The ordinary form of this moth is shown on Plate 103, Figs. 6 ♂, 7 ♀. The species varies greatly in the amount of dark mottling and clouding on the fore wings; sometimes this is much reduced, and the pale grey ground colour is then clearly seen; more often these wings are entirely clouded over with blackish or sooty brown, leaving only the white bracket-like mark above the inner margin, and the submarginal cross line, distinctly visible (var. *salicis*, Curtis). The moth flies in June and July, and sometimes in August and September.

The hairy caterpillar, which is somewhat humped on rings four and eleven, is figured in Plate 102, Fig. 1. It is dark brownish grey, marked on the back with a central series of black patches in which are reddish spots, and a row of white spots on each side; below the white spiracles is a yellowish wavy line with reddish warts upon it. Various low-growing plants, such as plantain, dock, sorrel, and also hawthorn, sallow, and bramble, afford it nourishment, and it is found in July, August, and September.

Generally distributed throughout England and Wales, its range extending into Scotland as far north as Morayshire; also in Ireland. The var. *salicis* occurs northwards from Shropshire through northern England into Scotland, but is perhaps most common in Ireland.

The Coronet (*Craniophora ligustri*).

This is also the Crown Moth of Moses Harris, both English names referring to a fancied resemblance of the whitish or pale

Pl. 104.

1, 3. **Archer's Dart.** 4, 6. **Turnip Moth.** 2, 5. **Shuttle-shaped Dart.** 7, 8. **Dark Sword Grass.** 9, 10. **Pearly Underwing.**

O 198.

Pl. 105. *O* 199.

1, 2. **Crescent Dart.** 3, 4. **Heart and Dart,** *males.*
5, 6. **Heart and Dart,** *females.* 7, 8. **Heart and Club.**
9, 10. **Light Feathered Rustic.**

greyish mark, just beyond the reniform stigma, to a crown or coronet (Plate 103, Fig. 5). The greenish or brownish-olive fore wings are subject to modification in the depth of tint; sometimes they are blackish in tone—var. *nigra*, Tutt, or dark olive-green—var. *olivacea*, Tutt. In both of these named forms the whitish markings are obscured, and in this respect they seem to be about identical with var. *sundevalli*, Lampa.

The caterpillar is bluish green above, and yellowish green below; a slender whitish line along the middle of the back, and a yellowish line on each side; the spiracles are reddish, and the raised spots, from each of which a single black hair arises, are black. It feeds in August and September on ash, and less frequently, perhaps, on privet. It is stated to eat hazel and alder, also.

The moth flies in June and July, and its occurrence in any locality depends largely upon the presence of ash. Widely distributed throughout England, Wales, and Scotland to Ross-shire. In Ireland it has only been noted from a few localities in Co. Galway.

Powdered Wainscot (*Simyra albovenosa*).

In its typical form (Plate 103, Fig. 10), the fore wings are whitish ochreous with the veins showing up white more or less clearly. A form with reddish ochreous fore wings has been named var. *ochracea*, Tutt; and another with silvery-white wings var. *argentea* by the same author. These seem to be identical with forms of this species named *flavida* and *albida* by Aurivillius some eight years earlier.

The hairy caterpillar is blackish or dark grey brown freckled with black; two stripes along the back and one on each side are yellow, sometimes marked with orange; the warts are orange with pale, and a few black, hairs; head black, marked with yellowish.

It feeds from July to September on the leaves of reeds, at night ; hiding by day under leaves low down. The moth is out in June, but an autumn brood is sometimes obtained. It only occurs in fenland, chiefly Norfolk and Cambridgeshire.

The Marbled Beauty (*Cryphia perla*).

Typically the fore wings of this species are white, marbled with slaty grey, and with the stigmata dark grey (Plate 103, Figs. 9♂, 12♀). There is less colour variation than in the last species, but in some localities greenish, ochreous, and ochreous brown forms have been obtained. The caterpillar is pale slaty grey, with an irregular yellowish stripe on the back, with black spots forming a central line ; the raised spots are black and shiny, as also is the head. Feeds on lichens growing on old walls from August to May. The moth, which occurs throughout England, Wales, Ireland, and Scotland up to the Clyde, is to be found, commonly as a rule, on walls by day, and gas lamps at night, in July and August. Sometimes I have found specimens on tree trunks.

Marbled Green (*Cryphia muralis*).

Two forms of this very variable little moth are represented on Plate 103, Figs. 8♂ (typical), 11♀. The ground colour of the fore wings ranges from almost white through pale green to bluish green or to a deep olive green, or through pale ochreous to orange brown. The markings, too, vary in intensity, and are sometimes very obscure. Several forms have been named, but only the Cambridge race, known as var. *impar*, Warren, can here be referred to. In this form the colour is more often greyish or brownish white, than green ; the markings are cloudy and not clearly defined.

The caterpillar is obscure greenish, with whitish and rather

shining raised spots ; there is a black plate on the first ring, and from this three broken yellowish lines run along the back. Head black and glossy. It feeds from October to May on the lichens growing on walls and rocks ; during the day it hides in a chamber formed of silk and lichen, which is not easy to detect in dry weather. The moth is out in July and August, and at Eastbourne I have found it in September. It may be found generally on walls, but sometimes on rocks at various places on the coast of Kent, Sussex, Dorset, Devon, and Cornwall ; also in the Scilly Isles. Its range, according to Barrett, extends to Bath and Wells, Somersetshire, Marlborough and Chippenham in Wiltshire, and it has also occured in Gloucestershire. It also occurs in Ireland.

The Tree-lichen Beauty (*Cryphia algæ*).

The only record of this species in England that I am aware of is that by Mr. Edleston, in the *Intelligencer* for 1860, p. 11, as follows: "Two specimens of this pretty species (*B. algæ*) were taken in this district last July." The district referred to was Manchester, and the note was written on September 28, 1859.

AGROTINÆ.

The Turnip Moth (*Agrotis segetum*).

The ordinary form of the male and the female is represented on Plate 104. The species is an exceedingly variable one, and Haworth (1803), believing them to be distinct species, gave Latin and English names to several of the different forms. The ground colour in the male ranges from pale whitish or brownish ochreous, with strong markings, to blackish brown, with the markings obscured. The female ranges in colour of

fore wings from greyish to blackish. Caterpillar, greyish brown, tinged with ochreous, or sometimes pinkish ; a glossy plate on first ring, greyish or brownish ; spots glossy, each with a tiny hair ; lines rather darker, but often indistinct. It feeds from July to April on various plants, but only attacks the tender stems near the surface of the ground. In fields it is destructive to turnips and swedes, making large cavities in the bulb, which it enters from just above the tap-root. The moth flies in June, and occasionally as a second generation in the autumn. Generally distributed over the British Isles, and often very common. Its range extends throughout nearly the whole of Europe and the greater part of Asia.

The Archer's Dart (*Agrotis vestigialis*).

The specimens shown on Plate 104 are typical of the sexes (Figs. 1 ♂, 3 ♀). The normal pale brown colour is sometimes replaced by greyish, reddish, or olive brown. A specimen with black fore and hind wings has been recorded from North Wales by Mr. Jäger. The markings vary in intensity, and occasionally are almost or quite absent. Several of the varieties have been named. The caterpillar, which feeds on bed-straw and various grasses, etc., is greenish grey, inclining to brownish above, with a dark-edged pale line along the middle of the back, and a similar line on each side ; the raised spots are black, and the plate on first ring brownish ; head ochreous, marked with darker. August to May. The moth is out in July and August, and is chiefly found on sandhills by the sea. It is most plentiful on the eastern and southern coasts, and in Cheshire, Lancashire, and Yorkshire : it is often not uncommon in the Brandon and Tuddenham districts, and others, in the "Breck Sand" area of Suffolk and Norfolk. The species has been recorded from Worcestershire, and I understand that a few specimens were taken in Surrey last August

Pl. 106. O 202.

1, 2. **Sand Dart.**
3, 4. **Coast Dart.**
5, 6. **Garden Dart.**
7, 8, 11. **White Line Dart.**
9, 10. **White Line Dart,** *var. aquilina.*
12. **Square-spot Dart.**

Pl. 107.

O 203.

1. **True-lover's Knot.**
2, 3. **Heath Rustic.**
4. **Portland Moth.**
5, 6. **Stout Dart.**
7, 8. **Dotted Rustic.**
9, 10. **Northern Rustic.**

(1907). In Scotland it occurs on the east coast, and in the Orkney Isles; also in Ayr, on the south-west. In Ireland, also, it is found on suitable parts of the coast.

The Heart and Club (*Agrotis corticea*).

The more usual form of the male and the female are shown on Plate 105 (Figs. 7 ♂, 8 ♀). The colour varies from pale brown to a whitish or greyish brown tint in one direction, and to reddish or blackish brown in another. The cross lines, generally well defined, are sometimes absent, or nearly so, in some of the pale forms, and much obscured in the dark forms. The black outlined reniform and orbicular stigmata are sometimes obscured by a blackish cloud; the pale-centred, club-like mark below them varies in length, and is occasionally reduced to a small spot. "*Noctua subfusca*," Haworth, has been determined by Mr. E. R. Bankes, who possesses the type, to be an obscurely marked fuscous ♂ example of this species. The greyish brown, rather rough-looking caterpillar, is freckled with a darker tint above, and inclined to greenish below; a fine, pale line along the middle of the back is edged with brownish, and on each side there is a pale line, edged above with brown, and below this a double pale line; head marked with blackish (Plate 109, Fig. 1). It feeds from March to April, after hibernation, on various low-growing plants, including goosefoot (*Chenopodium*), persicaria, knotgrass, dock, and clover. The moth is on the wing in June and July, and very occasionally in September. It is rather a common insect in eastern and southern counties bordering the sea, but extends into Surrey, and occasionally into Cambridgeshire, Oxfordshire, and Berkshire; and is also found more or less frequently in Herefordshire, Warwickshire, Staffordshire, Cheshire, Lancashire, and Yorkshire. In Scotland it occurs in Ayr, and on the eastern side to Moray. It has been taken in various

counties, on the coast, of Ireland from Cork to Sligo, and from Wicklow to Derry.

The Light Feathered Rustic (*Agrotis cinerea*).

Both sexes are shown in their typical forms on Plate 105. The fore wings of the male (Fig. 9) are generally pale greyish in colour, with blackish cross lines and central shade ; the claviform mark is absent, and the orbicular stigma usually so, or represented by a dusky dot ; sometimes the ground colour is brownish, occasionally purplish grey, and very rarely black. The female (Fig. 10) is smaller, and always much darker.

The caterpillar is blackish green or dark greyish, with three fine pale lines, the central one edged on both sides, and the others edged above, with a darker tint ; a pale stripe along the black spiracles ; head, and plate on first ring black. It feeds on wild thyme, and is said to eat dock. It hatches from the egg in late June or early July, and presumably hibernates when full grown, as it does not seem to feed again when it reappears in early spring.

The moth flies in May and June, and is only to be found on hills and downs in chalk or limestone districts. It occurs in Surrey, Dorset, Isle of Wight, Devon, Gloucestershire, Herefordshire, North Wales, Berkshire, Oxfordshire, Cambridge, Suffolk, Herts, Kent, and Sussex. It has only been taken once in Ireland. The small form, with narrow and distinctly marked fore wings, and whitish hind wings, occurring in the south of England, has been named var. *tephrina*, Staud.

The Shuttle-shaped Dart (*Agrotis radius*).

As will be seen by the figures on Plate 104, the sexes of this species also differ greatly in colour. Usually the cross lines on the fore wings of the male do not show up so distinctly as in

Fig. 2, which closely approaches a form figured and described as *radiola* by Stephens in 1829. Fig. 5 represents the typical blackish-brown female. Gynandrous specimens, one side ♂ the other ♀, have been recorded. The caterpillar feeds on dandelion, lettuce, knotgrass, and other low-growing plants, from September to April ; probably full grown before hibernation. The moth, which is out in July and August, sometimes in May, is partial to low-lying, marshy ground and meadows, and is widely distributed over the whole of the south of England, but it is seemingly rare in the north, and still more so in Scotland and Ireland. Barrett states that it has been found commonly in Carmarthenshire, Wales.

The Crescent Dart (*Agrotis trux*).

The British race of this moth, figured on Plate 105, Figs. 1♂, 2 ♀, has always been known as *A. lunigera*, which name Stephens gave it in 1829. It is now considered, however, to be only a local form of *A. trux*. Except that it has been reported to occur in the north of France, it seems to be peculiar to the British Isles. The earliest known specimens were captured near Cork in Ireland, June, 1826, and it is now found not only on the coasts of Cork and Kerry, but also on the Hill of Howth, near Dublin. In England it occurs in the Isle of Wight, Dorsetshire (Portland), Devonshire (Torquay), Cornwall, and the Scilly Isles. Reported from Sussex in 1918. In Wales it is to be found above Barmouth, and in various parts of South Wales ; and in Scotland around Edinburgh and on the Moray coast. The moth is out in July and August. Mr. A. E. Gibbs, writing of this species in Cornwall, remarks, " It is generally stated that *A. lunigera* is only to be taken on steep and dangerous cliffs, in places where sugaring is by no means a safe occupation ; but its abundance at Polzeath showed that this is not invariably the case. Here it was found on posts and flower heads in the valley at some

distance from the seashore, and so abundantly did it occur that one evening's work yielded upwards of fifty specimens."

The caterpillar is greyish or greenish grey, inclining to brownish above, and with darker brown marks on the back, lines paler, edged sometimes with darker grey; raised spots blackish, rather glossy; head brownish, marked with black, and the plate on first ring is black with a central yellow line. It feeds from August to May on various low plants growing in rocky places by the sea. Will eat dandelion, plantain, and knotgrass in confinement, also sliced carrot.

The Coast Dart (*Euxoa cursoria*).

The specimens whose portraits will be found on Plate 106 are more or less typical of the sexes of this most variable species. The ground colour of the fore wings ranges from whitish ochreous through all shades of brown up to dark reddish, and from whitish grey through leaden grey to brown grey. The markings, too, are exceedingly variable; the cross lines are often faint, sometimes entirely absent; the stigmata are frequently obscure, and occasionally the blackish lower part of the reniform is the only indication of these marks. There is often a white streak along the costa, and in some specimens this is very conspicuous (Figs. 3 ♂, 4 ♀).

The caterpillar feeds from September to June on various grasses growing on sandhills, and is said to eat wormwood and violet. It is ochreous in colour, more or less tinged with green; the lines are pale grey, edged with darker grey; spots brown, and head ochreous brown.

The moth is on the wing from late July to early September, and is to be found on all the larger tracts of sandhills on the east coast from Suffolk northwards, and on the coasts of Cheshire and Lancashire. It is not common on our southern coasts, but occurs in Dorsetshire and Devon. In Scotland it is obtained

on the Firth of Forth, Kincardine, and Aberdeen coasts, and also in the Hebrides, Orkney, and Shetland Isles; and on very many parts of the coast of Ireland.

The Garden Dart (*Euxoa nigricans*).

This moth is typically sooty or blackish brown in both sexes (Plates 106, Figs. 5 ♂, 6 ♀), but varies to pale brown, or through various shades of red brown. The markings, usually obscure, occasionally are well defined, and sometimes there are additional black spots and pale streaks. The caterpillar is pale or dark ochreous brown on the back, inclining to greenish on the sides; lines greenish grey, edged with black, and a double whitish one low down on the sides. It feeds from March to June, on clover, plantain, dock, and various other low plants; and also cow-parsnip and other umbelliferæ. The moth flies in July and August, and is to be found in most English counties, but perhaps most commonly in the eastern. In Scotland it ranges to Moray, and seems to be generally distributed in Ireland.

The White-line Dart (*Euxoa tritici*).

This is another exceedingly variable species. The ground colour of the fore wings ranges from pale whitish or ochreous brown, through various tints of greyish and red brown, up to black or sooty brown; variation in markings is somewhat similar to that referred to in *A. cursoria*. Three forms are shown on Plate 106, Figs. 7, 8, and 11; the latter represents a specimen closely approaching *A. obelisca*. Var. *aquilina* (Figs. 9 and 10), the English name of which is the Streaked Dart, is larger than the type, and the wings, consequently, are broader; by some entomologists it is considered to be a distinct species.

The caterpillar is obscure greyish or brownish, with a dark-edged pale line along the middle of the back, and a dusky line

on each side of it ; low down on the sides is another dusky line. It feeds from March to June on mouse-ear chickweed, bedstraw, plantain, and other low-growing plants growing on sandy soils. *Aquilina* is more of an inland insect than *tritici*.

The moth is out in July and August, and is widely distributed throughout the British Isles, including the Orkneys and Shetlands, but especially common on coast sandhills.

The Square-spot Dart (*Euxoa obelisca*).

The fore wings of this moth (Plate 106, Fig. 12) are pale greyish brown, purplish brown, or sometimes slaty brown, with fairly distinct black cross lines, and a pale streak along the front edge ; the first line is straight and less angled, and the second line less curved towards the front margin than in *A. tritici*. The caterpillar, which feeds from about October to July on rock rose, bedstraw, and other low plants growing in rocky places by the sea or on hillsides, is very similar to that of the last species. The moth is out in August and September in its special haunts. A well-known locality for it is Freshwater in the Isle of Wight, but it may be obtained at Torquay, Devonshire ; Padstow, Cornwall ; and the Scilly Isles. Also recorded from Sussex, Gloucestershire, Herefordshire, South Wales, Derbyshire, Cheshire, Lancashire, and Yorkshire. In Scotland on the south-west and east coasts ; and in Ireland at Howth, Dublin ; Dungarvan, Co. Waterford ; and Mt. Charles, Donegal. See Appendix.

The Heart and Dart (*Agrotis exclamationis*).

On Plate 105 are figured two examples of the male (Figs. 3, 4,) and two female specimens (Figs. 5, 6). The colour of the fore wings ranges from pale whitish brown through various shades of brown and grey to a sooty brown or black. The cross lines are rarely very distinct, the reniform, orbicular, and claviform marks are, however, generally much in evidence ; but either

Pl. 108. *O* 208.

1, 2, 4, 5. **Northern Dart.**
3. **Rosy Marsh Moth.**

Pl. 109. *P* 209.

1. **Heart and Club:** *caterpillar.* 2. **Heath Rustic:** *caterpillar.*
3. **Neglected Rustic:** *caterpillar* 4. **True-lover's Knot:** *caterpillar.*

of the two last, sometimes both, may occasionally disappear. Not infrequently the reniform is connected with the orbicular by a black streak from the former; more rarely the claviform is much widened and lengthened, and almost united with a dusky cloud above it (var. *plaga*, Steph.). This species is sometimes mistaken for *A. corticea*, but apart from the shorter teeth of the male antennæ, the present species has a distinct, and often conspicuous, black mark on the front of the thorax.

The caterpillar is brownish with darker pear-shaped marks on the back; lines dark edged; spiracles black and of large size. Head pale marked with brown. It feeds from July to May on various low herbage, including lettuce, chickweed, plantain, and goose-foot; also turnips.

The moth flies in June and July (sometimes in September), and is generally common; but in Scotland it does not appear to extend north of Moray and Argyll. Common in Ireland.

The Dark Sword Grass (*Agrotis ipsilon*).

The sexes of this moth are represented on Plate 104, Figs. 7 ♂ and 8 ♀. In occasional specimens of the male the ground colour of the fore wings is rather pale brown; otherwise there is little variation to note. The caterpillar feeds from April to July on roots and leaves of cabbage, lettuce, goose-foot, and many low plants; also on swedes, mangold wurzel, etc. It is purplish or bronzy brown above and somewhat greener on the sides; the usual spots are blackish and the lines greyish edged with darker. Head black with two white spots. The moth is on the wing from July to September, and as it is sometimes seen in April and May and earlier, it is said to have probably hibernated. Possibly, however, such early specimens, found at least once in February, are immigrants. Sometimes the species is common and at others rare. It has occurred at one time or other almost everywhere in the British Isles, but it seems to be most regularly obtained in England and in Ireland.

Abroad its range extends through Europe, Asia, and North America, and also to Australia, and Honolulu.

The Sand Dart (*Agrotis ripæ*).

This species varies a good deal in the ground colour of the fore wings. According to Barrett it ranges from pure white through pale reddish, rich reddish (var. *desillii*, Pierret) reddish drab, yellowish drab, and various shades of pale brown to brownish grey, and the markings to all degrees of distinctness or obliteration, especially the latter. The two specimens on Plate 106 have the markings fairly well defined (Fig. 1 is a male, and Fig. 2 a female).

The caterpillar is ochreous grey, whitish tinged with pink, or greenish ; the lines and spots are greyish, and the spiracles large and black ; head and plate on first ring ochreous brown. It feeds on saltwort (*Salsola*), sea rocket (*Cakile*), seablite (*Suæda*), sea holly (*Eryngium*), and various other plants that flourish on sandy shores. It is usually full grown in late autumn, when it goes down some depth into the sand, but does not pupate until the spring. If the caterpillars are not full fed when obtained they must be furnished with plenty of sand to burrow in, and kept supplied with slices of carrot until it is seen that the last put in remains untouched.

The moth flies in June and July, and may be found on the coasts of Lincolnshire, Norfolk, Suffolk, Essex, Kent (Deal), Isle of Wight, Dorset, Devon (Dawlish and Torquay), Somersetshire, South Wales, Cheshire, Lancashire, and the Isle of Man. Rare in Scotland and in Ireland. It also occurs in Sussex.

The True Lover's Knot (*Lycophotia porphyrea*).

The white marked reddish moth (Plate 107, Fig. 1) frequents most of the moorlands and heath and ling-clad heaths and

commons throughout the British Isles. It varies in the tint of the reddish colour, and in the greater and lesser prominence of the white markings. Specimens from Scotland, especially from the Shetland Isles, are generally larger than English examples, and are often clouded with darker tints. The caterpillar, which is figured on Plate 109, Fig. 4, is reddish brown with a pale line along the middle of the back edged with dark brown or blackish marks on each side ; a whitish or pinkish white stripe along the sides with a brown edging above. Head ochreous brown, marked with darker. It feeds on heath and heather, and hides by day in the moss or among dead leaves, etc., below the food plant, August to May. The moth flies, sometimes by day, but usually at night, in June, July, and in late seasons in August.

The Portland Moth (*Actebia præcox*).

The pretty greenish moth with black cross lines, white spots, and reddish-brown clouding on the outer area (Plate 107, Fig. 4), is said to have been first reared in this country by the Duchess of Portland, early in the nineteenth century, hence the English name. Although occasionally found several miles from the sea, it is essentially a coast species, and may be obtained on the sandhills of Dorsetshire, Devon, Suffolk, Norfolk, Cheshire, Lancashire, Yorkshire, and the Isle of Man. Odd specimens occasionally occur inland, as for example at Kendal (1899), and in Worcestershire (1901 and 1903). In Scotland it is found in suitable places along the west coast, from the Firth of Clyde to Sutherland, and on the east to Moray ; and it is widely spread on the coasts of Ireland. The caterpillar is slaty grey ; central line on the back whitish or pale greyish, expanding on each ring and so forming a series of connected spots, edged with darker tint ; then a whitish stripe, edged above by a slender black line ; a whitish or bluish grey stripe along the black spiracles. Head pale

brown, obscurely marked with darker. It feeds from September to June on dwarf sallow, grasses, chickweed, wormwood, etc. The moth flies in August.

The Pearly Underwing (*Peridroma saucia*).

Two specimens, both males, are represented on Plate 104. Fig. 10 is more or less typical and Fig. 9 is referable to var. *margaritosa*, Haworth; both occur together wherever the species is found, but the typical form is generally the most frequent.

The caterpillar, which tapers slightly towards the head, is reddish grey or brown above and paler on the sides; a line along the middle of the back is yellowish and edged with dark brown dashes; the line along the greyish ringed black spiracles is pale and edged above with black; a yellowish blotch on the last ring and a black bar on ring eleven; head pale brown or greyish brown marked with black. It feeds on most low plants; also on cabbage and rape. It occurs in June and July, and in a second generation in September, October, and sometimes November. From eggs laid in September the caterpillar hatched in from five days to a fortnight and moths resulted from these about six weeks later.

Although it certainly does occur in May and June sometimes, the moth is very much more frequently seen in autumn. On the south coast, extending to Cornwall and the Scilly Isles, the species is possibly a resident. In other parts of the British Isles its occurrence is more or less casual, and, although common in some years in other southern, and also eastern and northern counties, it does not seem to be permanently established therein. No doubt its more general distribution, and abundance here and there, in certain years, is due to the arrival of immigrants, either in small numbers in the spring, or in swarms later on in the year.

The distribution abroad includes Central, Western, and Southern Europe; Asia Minor; Northern Africa, Canaries, and Madeira; North America.

The Northern Rustic (*Ammogrotis lucernea*).

The specimens of this locally variable species shown on Plate 107 are from Scotland (Fig. 9 ♂), var. *renigera*, Stephens, and North Wales (Fig. 10 ♀). Barrett (*Brit. Lep.*, vol. 3), discussing the variation, remarks, "On the south coast of England, and especially at Portland, the general tint is pale smoky grey, much darker towards the hind margin, and with the markings moderately distinct; inland mountainous districts, especially in North Wales, produce a still paler form; coast districts in the west and north a decidedly darker; and in the far west, as in Kerry, some specimens are actually slate-black, without more than the faintest trace of markings. The Isle of Wight produces deep slate-coloured specimens, darker than those from the Isle of Man, which are grey brown. Shetland specimens are large and dark, even to glossy blue-black." The caterpillar is dusky olive green, mottled all over with small black streaks and dapplings; each segment of the body having a faintly indicated pale olive-green spot on each subdorsal region, below which, on each side, is an oblique shading of blackish green. Head shining black-brown, rather lighter brown at the sides (Barrett). It feeds on harebell (*Campanula*), stonecrop (*Sedum acre*), saxifrage, cowslip, chickweed, and grasses, from August to May. The moth flies in July and August, and in the north and west in September. It occurs in rough stony places, on rocky places on the coast, and on hills inland, in Kent (Folkestone district), Isle of Wight, Dorset, Devon, Cornwall, Gloucestershire (rare), Sussex, Shropshire, Wales, Lancashire (rare), Yorkshire, and Westmoreland. It is widely distributed in Scotland and Ireland.

The Dotted Rustic (*Rhyacia simulans*).

The sexes of this local moth are figured on Plate 107. Fig. 7 represents a male from Aberdeen, and Fig. 8 a female from Dorsetshire. The latter is of a pale brown colour on the fore wings, and this is somewhat unusual, as the prevailing colour of specimens from the Dorset coast is greyish brown.

The caterpillar is ochreous brown, dotted with brown, and marked with dark brown, sometimes greenish tinged, on the back; a white stripe below the spiracles; head brown and rather glossy. It feeds on grasses and low plants, such as dock, dandelion, groundsel, etc. September to May. The moth flies in July, August, and September. It occurs at various places on the Dorsetshire coast; on the Cotswolds in Gloucestershire; in North Wales, and the Isle of Man; also from Cheshire to Cumberland. Widely distributed in Scotland, extending to the Hebrides and the Orkneys. In Ireland only recorded from Sligo.

The Heath Rustic (*Amathes agathina*).

The moth, shown on Plate 107, varies in colour and in marking. Fig. 2 depicts a specimen from Perthshire, and Fig. 3 one from North Devonshire. In Southern England the general tint is pinkish brown, and in the north and in Scotland it is dark reddish brown or blackish. A pale greyish form from Ireland has been named var. *hebridicola*, Staud. Sometimes specimens are distinctly rosy in tint, and these are referable to var. *rosea*, Tutt. The caterpillar (Plate 109, Fig. 2) is reddish brown, or green, with whitish lines on the back, the central one edged on each sides with blackish, and the others inwardly marked with black; a yellowish stripe low down along the sides, sometimes marked with reddish; usual dots black; spiracles white, dark ringed; head greenish yellow marked with darker

Pl. 110. *P* 214.

1. **Ashworth's Rustic.** 2, 3. **Neglected Rustic.** 4. **Autumnal Rustic.**
5. **Plain Clay.** 6. **Double Dart.** 7. **Flame Shoulder.**
8. **Setaceous Hebrew Character.** 9. **Triple-spotted Clay.**

Pl. III.

P 215.

1. Flame Shoulder: *caterpillar.*
2. Triple-spotted Clay: *caterpillar.*
3. Double Dart: *caterpillar.*

in the green form, and yellowish brown marked with darker in the brown form. It feeds from September to June on heath and heather. The above brief description was made from apparently full-grown caterpillars received from the New Forest on May 28, 1907, but not one of them attained the chrysalis stage. The moth is out in August and September, and occurs on most of the larger heaths, and on moorlands throughout the British Isles, including the Hebrides and Orkneys.

The Stout Dart (*Spælotis ravida*).

The somewhat dingy brown, or greyish brown moth (Plate 107, Figs. 5 ♂, 6 ♀) is sometimes tinged with reddish, and this tint is generally present on the front or costal area.

The caterpillar is ochreous brown with a paler line along the back, and a series of dark edged, oblique and more or less curved, yellowish marks on each side ; head greyish freckled with brownish ; plate on first ring brown marked with pale lines. It feeds on low-growing plants such as dock, dandelion, chickweed, etc. ; September to May. The moth flies in July and August, but its occurrence in Britain is somewhat irregular. It is found, sometimes commonly, in most of the southern and eastern counties of England, and also in Durham ; and has been occasionally recorded from other parts of the country, as well as from Scotland. For several years it may seem to quite disappear and then suddenly become common in various districts. Its range abroad extends to Amurland, North China, Corea, and Japan.

The Northern Dart (*Amathes alpicola*).

Of this pretty Scottish species (*alpina*, Westw. and Humph.) four examples are figured in Plate 108. Figs. 1 and 2 represent specimens from Shetland, and Figs. 4 and 5 are from Rannoch specimens. These will show something of the variation in this

moth, which was not known to occur in the British Isles until 1839, when a single specimen was taken on Cairn Gowr in Perthshire. No other example seems to have been noted up to 1854, when one was found on a rock in the same part of Perthshire. Up to the year 1876, only a few specimens had been obtained, but in that year, which was a hot and dry one in the Highlands, quite a number were secured. A female was also detected laying her yellowish white eggs on crowberry (*Empetrum nigrum*) and thus gave a clue which led to the subsequent discovery of caterpillars and chrysalids ; and these have been obtained in some quantity. The caterpillar is reddish, inclining to pinkish brown, freckled with darker ; three whitish lines on the back, the central one irregularly black dotted, edged on both sides with black, and the others with black bars along their inside edge ; head pale brown freckled and lined with darker brown. It feeds from August to June (of the second year following hatching from the egg, it is said), on crowberry, bilberry (*Vaccinium*), and bearberry (*Arctostaphylos uva-ursi*).

The moth is out from late June until about the middle of August. It only occurs with us on the higher mountains in Perthshire, notably those to the south of Loch Rannoch ; and at lower elevations in Unst, the most northern isle of the Shetland group. It has also been recorded from the Orkneys. Kane mentions a specimen bred at the end of February, 1893, at Clonbrock, Co. Galway, from a caterpillar found at a bog in the vicinity, where crowberry grows abundantly. Abroad the species in its typical form is found on mountains in Central and Southern Scandinavia, and in modified form in Silesia, Hungary, and Switzerland.

Ashworth's Rustic (*Amathes ashworthii*).

This moth, which is figured in Plate 110, is considered by some entomologists to be a form of *A. candelarum* peculiar

to the hills and mountains of North Wales, and found chiefly at Llangollen, Penmaenmawr, and Snowdon. The colour of the fore wings varies from pale dove colour to dark slaty grey. The caterpillar is blackish, or dark slate colour, with two series of velvety black spots, or dashes along the back; head reddish brown. It feeds on various low-growing plants, among which are rock-rose, wild thyme, sheep's sorrel, bedstraw, etc. Towards the end of April, in Flint, they feed freely and crawl about their food plants in the day time as well as at night (E. W. H. Blagg). The moth has been reared in November and December from eggs found in July, about the second week; the caterpillars having been supplied mainly with sallow, with the addition of dock, groundsel, plantain, and knot grass (R. Tait). On another occasion moths were bred in October from eggs laid by a female reared from caterpillars taken in North Wales in the spring (A. Harrison). The moth is out in July and August and in its rugged haunts, may be disturbed from among the loose rubble, and from chinks in the rocks; but as they come freely to sugared herbage, captives in this way would probably be more numerous. Discovered at Llangollen in 1853, by Mr. Joseph Ashworth after whom it was named by Doubleday in 1855.

NOTE.—Barrett mentions the following Agrotids as having occurred in the British Isles.

A. crassa, Hübn., "one specimen in the cabinet of Mr. S. Stevens." *A. spinifera*, Hübn., a specimen taken in the Isle of Man, August, 1869. *A. fennica*, Tauscher, a specimen recorded in the *Zoologist* for 1850, as captured in Derbyshire.

The Rosy Marsh Moth (*Cœnophila subrosea*).

The last two moths were respectively productions of Scotland and Wales; the present one is exclusively English, at least it was, because now and for perhaps the last fifty years it has been extinct in its old fenny haunts at Whittlesea, in Cambridgeshire,

and Yaxley, Huntingdonshire. In the latter fen it was first noted by Weaver about the year 1837. In 1846 and onwards it was plentiful, and the caterpillars were common. All was well with the species until about 1851 when the fens were drained, and the moth then ceased to appear. (Plate 108, Fig. 3.) In Sweden, Southern Russia, and in Amurland the species is represented by a bluish form, var. *subcærulea*, Staud.

The Double Dart (*Graphiphora augur*).

The dull brownish moth (Plate 110, Fig. 6), is generally distributed throughout the British Isles, including the Orkneys. The fore wings of southern specimens are usually suffused with reddish, but this is less obvious in northern examples. The markings are sometimes bold and striking or, on the other hand, only faintly defined, or largely absent. A pinkish-tinged brown form without markings was formerly confused with the Continental *A. helvetina*. The moth is on the wing in June and July, sometimes in August, especially in the north ; and the caterpillar is to be found from July to May. When young it feeds on various low-growing plants, but later it crawls up at night to devour the leaves of hawthorn, sloe, sallow, birch, etc. It is brownish, tinged with pink, and marked on the back with a series of V-shaped dashes, and white points ; on ring eleven there is a yellowish-edged black mark ; above the white spiracles is a black-edged red-brown stripe. Head pale brown, freckled with darker brown.

The Autumnal Rustic (*Amathes glareosa*).

In its typical form as depicted on Plate 110, Fig. 4, this species is slaty grey with black markings. In Devonshire and other parts of the west of England, and also in Ireland, it assumes a decided pinkish tinge (var. *rosea*, Tutt). Through Scotland the colour becomes darker grey, and in Perthshire it

Pl. 112. *P* 218.

1. Ingrailed Clay: *caterpillar.*
2. Purple Clay: *caterpillar.*
3. 3*a*. Square-spot Rustic: *caterpillar.*

Pl. 113. *P* 219.

1. **Double Square-spot.**
2. **Square-spotted Clay.**
3, 4. **Purple Clay.**
5, 6, 7. **Ingrailed Clay.**
8, 9. **Ingrailed Clay,** *var. conflua.*
10, 11. **Ingrailed Clay,** *var. thulei.*

merges into blackish grey. In the Shetlands a blackish, or sooty-brown form (var. *edda*, Staud.), occurs.

The caterpillar feeds on grasses and various low plants, also on ling, heath, sallow, and has been found on wild hyacinth. It is yellowish-brown with dark shaded pale lines on the back, and a dark brown stripe on the sides ; spiracles and dots blackish. October to June. The moth flies in August and September, and affects heathy places, borders of woods, etc., throughout the British Isles, including the Hebrides, Orkneys, and Shetlands. Except in the New Forest, Hampshire, it does not seem to be common in the southern counties of England ; it occurs in Epping Forest, and in other parts of the eastern counties ; northwards it becomes more generally distributed and more plentiful.

The Neglected, or Grey Rustic (*Amathes castanea*).

The reddish typical form of this species is shown on Plate 110, Fig. 3. Fig. 2 represents the greyish form, var. *neglecta*, which is most frequently met with in southern England. Between these extremes intermediate forms occur connecting one with the other. Specimens of a pale ochreous colour have been obtained in the vicinity of Market Drayton, Shropshire. The caterpillar, which feeds on heather and sallow at night, is pale reddish-brown, finely powdered with greyish ; below the pale ochreous stripe on the sides, the ground colour is greenish ; head marked with darker brown. September to May. The moth flies in August, and occurs on the larger tracts of heathery ground throughout the British Isles, but it is commoner in some parts than in others, and appears to be scarce in Ireland. The red form, and intermediates, occasionally occur in the New Forest, and also in other parts of Southern England, but in Scotland it is not uncommon. The distribution abroad is, like that of the last species, pretty much confined to Western Europe. The caterpillar is shown on Plate 109, Fig. 3.

The Dotted Clay (*Amathes baja*).

This species, a male and female of which are shown on Plate 114, Figs. 7 ♂ and 8 ♀, is common in wooded districts throughout the British Isles, except the Orkneys and the Shetlands. The colour of the fore wings ranges from pale greyish brown, or reddish grey, to reddish brown or purplish brown. Sometimes the first and second cross lines are bordered, or represented, by pale bands.

The caterpillar is dingy ochreous brown, or reddish brown; three yellowish lines along the back, the central one edged with blackish; the others have blackish bordered yellow triangular marks between them, on each ring from three to eleven; spiracles and dots black; head pale brown, shining. It feeds in the autumn on various low plants, and in the spring on hawthorn, sloe, sallow, bramble, etc. September to May. The moth flies in July and August. Its range abroad extends to Amurland and to North America.

The Plain Clay (*Amathes depuncta*).

This species is represented on Plate 110, Fig. 5, by a female specimen. Sometimes the fore wings are more reddish brown in colour, and the markings are occasionally bolder. The caterpillar is pale or dark reddish brown above, and rather greyish below; the back is marked with dark outlined diamonds, and the dark edged white spiracles have a dark shade above them, and an ochreous stripe below; head pale brown marked with darker. Feeds on primrose, dock, sorrel, nettle, etc. from September to May. The moth flies in July, August, and the early part of September. It seems to be more frequently and regularly obtained in Scotland, especially in the woods of Perthshire, Aberdeen and Moray. In England the species is, or has been, found in Oxfordshire (rare in beech woods),

Berkshire, Wiltshire (Savernake Forest), Devonshire (Dartmoor), South Wales (near Swansea), North Wales (Mold), Cheshire (one specimen, Staley-brushes), Yorkshire (Scarborough), Durham (one at Bishop Auckland), Cumberland (Barrow Wood). The range abroad includes Central Europe (except Holland and Belgium), Southern Sweden, Lavonia, and South-east Russia, Armenia, and Northern Asia Minor. It may be noted that Stephens, writing in 1829, considered this to be a doubtful British species.

The Setaceous Hebrew Character (*Amathes c-nigrum*).

A male specimen of this often common and generally distributed species is shown on Plate 110, Fig. 8. The fore wings vary in colour, from pale reddish grey through bright reddish or pinkish brown to purplish brown; the costal mark may be whitish, ochreous, or pinkish tinged. The moth is most frequently obtained in the autumn, but it is sometimes met with from May to July.

The caterpillar is pale brownish or greenish grey, with two series of black streaks, and a dark-edged pale central line, on the back; below the black outlined white spiracles is a black-edged yellow ochreous, or whitish stripe; head ochreous brown streaked with darker brown. It feeds on dock, chickweed, groundsel, and other low plants. It is said to feed from September to April or May. Possibly, however, in favourable seasons, some may pupate either in the autumn or in the early months of the year, and so attain the moth state greatly in advance of the majority. The range of this species' distribution extends to India, Corea, Japan, and North America.

The Black Collar (*Agrotis flammatra*).

Fore wings pale greyish brown, with dark-edged pale cross lines; a pale whitish brown pink-tinged streak along the front

margin to the second line; below this is a short black dot; the reniform and orbicular marks are pale, the centre sometimes darker, and the claviform has a dark edge but is not distinct; the front of the thorax is broadly marked with black, hence the English name.

Only three British examples seem to be known; two of these were captured in the Isle of Wight, 1859 and 1876, and the third occurred in the lighthouse at Cromer in 1875. The range abroad is Central and Southern Europe, Western and Central Asia and India.

The Triple-spotted Clay (*Amathes ditrapezium*).

The ground colour of the fore wings of this moth ranges from pinkish brown through pale reddish brown to a purplish grey brown. The specimen shown on Plate 110, Fig. 9 ♂ is of the pinkish brown form from Tilgate Forest in Sussex. In a series bred from caterpillars obtained at Hampstead, North-west London, the bulk of the males are pale reddish brown, and the females purplish brown; one male, however, is as dark as the females. Caterpillar, purplish brown, mottled above with dark brown; a thin white line, interrupted with black, along the middle of the back, and a row of black marks on each side; on the sides are oblique blackish marks, with the white spiracles showing distinct at their lower ends. Head pale shining brown, the cheeks marked with darker brown. Feeds on dandelion, dock, chickweed, primrose, and other low plants; also on bramble and sallow, and in the spring on the young leaves of birch. September to May (Plate 111, Fig. 2).

The moth flies, in and around woods, in July. It is local and not always common, but has been found in the north-west and south-west districts of London, Kent, Surrey, Sussex, Hampshire, Dorsetshire, Devon, Wales (Swansea and Barmouth), and Norfolk (Cromer). It occurs in Scotland (Perthshire), and

two specimens have been recorded from Ireland. Its range extends to Siberia and Amurland.

The Double Square-spot (*Amathes triangulum*).

This species (Plate 113, Fig. 1) is usually pale brown, more or less tinged with reddish, but some specimens are of a rather darker hue, and others inclined to greyish. The conspicuous marks in the discal cell, usually black or blackish, are sometimes pale or dark reddish brown. The moth flies in June and July, and occurs in woods or well-timbered districts throughout England (except in Somerset, Dorset, and westward), Wales, Scotland (mainland), and Ireland. (See Appendix).

The Square-spotted Clay (*Amathes stigmatica*).

As will be seen from its portrait (Plate 113, Fig. 2), this moth, although darker in colour, is marked somewhat similarly to the last referred to. It should be noted, however, that the basal line is less distinct; the submarginal line is inwardly shaded with blackish, and there is no blackish spot at its costal extremity. The fore wings are sometimes pale reddish brown, and sometimes almost blackish.

The caterpillar, which is ochreous, or brownish, is somewhat similar in marking to that of *A. ditrapezium*, and feeds on dandelion, dock, chickweed, plantain, sallow, etc. In confinement it is said to eat sliced carrot or potato, and, if kept warm, may be induced to feed up and attain the moth state early in the year.

The moth flies in July and August and seems to be partial to woods. It is very local, but occurs not uncommonly in the New Forest, Hampshire, and in Oxfordshire and Berkshire beech woods; also found in Buckinghamshire, the Eastern Counties, Kent, Sussex, Dorsetshire, Devon, Lancashire (once), Yorkshire (very local), and North Wales (once). In Scotland

it appears to be more widely spread, but has not been noted in Ireland.

The Purple Clay (*Diarsia brunnea*).

The fore wings of this moth (Plate 113, Figs. 3, 4) range in colour from purplish brown to reddish brown, or pale reddish brown; some of the darker forms are suffused with greyish, and the central area is occasionally ochreous tinged. There is also variation in the markings, especially the reniform stigma which is usually more or less filled in with ochreous or whitish tint, but not infrequently it is merely outlined in one of these colours, and the centre is then dark grey brown, sometimes enclosing a whitish or ochreous crescent. These remarks are of general application, but refer to a long series I obtained in North Devon.

The caterpillar (Plate 112, Fig. 2) is reddish brown with a yellowish tinge and with black dots and ochreous markings. It feeds on bilberry, wood-rush (*Luzula*), various low plants, bramble, sallow, and in the spring it attacks the buds and young leaves of the birch saplings, etc. August to May. The moth flies in June and July, and is often common in woods over almost the whole of the British Isles, including the Hebrides and the Orkneys. The range abroad extends to Amurland.

The Ingrailed Clay (*Diarsia festiva*).

This species, also known as *primulæ*, but for which the earlier name *festiva* will have to be adopted, is exceedingly variable. Specimens of the more or less typical form and also of the forms known as *conflua* and *thulei* are portrayed on Plate 113. The fore wings range in colour from pale ochreous to chestnut brown, and from grey to smoky grey brown. The cross lines are distinct in some specimens, but in others are hardly visible; the discal cell is often no darker than the

general colour, but sometimes there is a reddish square spot in place of the usual black one : the reniform and orbicular marks may be only faintly outlined, and the latter sometimes cannot be traced ; the brownish band-like shade between the outer and submarginal lines is frequently only indicated by a short dash from the front margin, and even this is occasionally absent.

The smaller moorland and mountain form, var. *conflua*, Treitschke, and in the vulgar tongue The Lesser Ingrailed, varies on somewhat similar lines. (Plate 113, Figs. 8, 9.) Var. *thulei*, Staudinger, also varies greatly in colour and in marking. Some specimens are dark reddish brown, or occasionally smoky brown ; others are pale reddish brown, grey brown, reddish grey, or grey ; the pale cross lines are generally distinct, in the darker specimens especially. This form, which is peculiar to the Shetland Isles, is shown on Plate 113, Figs. 10, 11. In the foregoing remarks reference has been made only to the general trend of variation ; many other forms of aberration in this species might be mentioned if space permitted.

The caterpillar is pale or dark reddish or olive brown inclining to pinkish between the rings ; the lines are yellowish, the central paler edged with brown, and the outer ones edged with blackish marks ; oblique darker dashes on the sides ; spiracles black, ochreous ringed, with a pale stripe below them ; head pale brown marked with darker. It feeds on primrose, bilberry, dock, sallow, hawthorn, bramble, etc. August to May. (Plate 112, Fig. 1.) The moth flies in June, but specimens of a second generation have been obtained, in confinement, from August to October. The species in one form or another occurs in woods, on moorlands, etc., over the whole of the British Isles.

The Barred Chestnut (*Diarsia dahlii*).

The sexes of this species are depicted on Plate 114. It will be noted that the female (Fig. 2) is darker in colour than the

male (Fig. 1). The sexual colour difference holds good generally, but there are exceptions and the male may sometimes be dark, like the female ; or the latter sex may occasionally assume a reddish coloration. As a rule the reniform mark is most distinct in the female. A form occurring in Ireland with the fore wings dark sepia colour and the reniform mark clear whitish has been named var. *perfusca*, Kane. The caterpillar varies in the colour of the back through various shades of ochreous and brown to dark reddish brown, and this is always in strong contrast with the colour of the lower parts ; the lines are pale, and the outer ones on the back are edged with black dashes ; spots and spiracles black ; head pale brown. It feeds on dock, plantain, etc., and in the spring on young sallow leaves. In confinement will become full grown before Christmas, but normally it feeds from September to May. The moth is out in late July and in August. It is found on heaths, moorlands, and in woods ; it is not uncommon in some parts of the Midlands, and is found in Cheshire and northwards to Cumberland. It also occurs in Herefordshire, Pembrokeshire ; in the south and east of England it is not frequent, but has been taken in South Oxfordshire, Berkshire (Newbury), Suffolk, Hants (Winchester and New Forest), etc. Widely distributed in Scotland, and locally abundant in Ireland. The distribution abroad extends to Amurland and Japan.

The Small Square Spot (*Diarsia rubi*).

There are two generations of this species. The first is on the wing in June, and the second in August, September, and sometimes even in October. An example of each brood is shown on Plate 114, Fig. 3, 1st gen , Fig. 4, 2nd gen. The early moths are larger in size than the later ones, but are fewer in number. Moths of the second generation often abound at the sugar patches, and on ragwort blossom. The colour of

the fore wings varies from pale to dark reddish brown in both broods.

The caterpillar is greyish ochreous or brown, with dark-edged paler lines, and the brown head is marked with darker. It feeds on dandelion, dock, grass, etc. Those of the first generation feed from autumn to spring, and those of the second during the summer. The moth is found in almost every part of the British Isles, except, perhaps, the Hebrides and Shetlands.

The Six-striped Rustic (*Amathes sexstrigata*).

This species (Plate 114, Fig. 5), is also generally distributed over our islands as far north as Moray, but it is rather partial to marshy situations. The caterpillar, which feeds from August to May on dock, plantain, bramble, bedstraw, etc., is pale ochreous or brownish, freckled with darker, and with dark-edged, pale ochreous lines on the back, the outer ones with a series of black wedges along them ; a dark brown stripe low down along the sides ; head pale brown marked with darker. The moth flies in July and August. It seems to prefer the flowers of the ragwort and the honey-dew on foliage to sugar, but the latter has attractions for it nevertheless.

Cousin German (*Triphæna sobrina*).

On Plate 114, Fig. 6, is a portrait of this greyish suffused purple-brown species, which in the British Isles is seemingly confined to certain localities in Perthshire and Aberdeen, and was first met with in the former county by Weaver in 1853. According to Barrett it is found chiefly in mountain districts from 700 feet above sea-level upwards.

The caterpillar is reddish or red brown, slightly mottled with grey ; the marking on the back almost linear, widening a little, but narrowly lozenge-shaped near the end of each ring, and

having on the widest part a round pale spot of dirty ochreous; sides much mottled with grey; dots and spiracles black, and under the latter a pale pinkish, ochreous, brown stripe; head shining brownish ochreous, with two black dots in front of each lobe. (Adapted from Buckler.) It feeds on heather, bilberry, birch, grass, etc. September to June. The moth flies in July and August.

The Square-spot Rustic (*Amathes xanthographa*).

Four examples of this very common and most variable species are shown on Plate 114, Figs. 9–12. The colour of the fore wings ranges from whity brown, or drab, through various shades of grey-brown and red-brown to blackish. The more or less square reniform, and the orbicular, marks are subject to a good deal of modification; in some specimens they are whitish or ochreous and very conspicuous, and in others exceedingly faint or entirely missing; or the reniform may be well defined and prominent, and the orbicular absent; the cross lines are frequently obscure, except the dark-edged, pale submarginal, and this, too, may be wanting; occasionally there is a blackish shade between the stigmata and extending from the front to inner margins. The hind wings of the males are whitish, with a dark marginal border of variable width, but rarely, so far as I have noted, entirely absent; those of the females are uniformly darker.

The full-grown caterpillar (Plate 112, Fig. 3) is hardly separable from that of *N. umbrosa*, and feeds at the same date on low-growing plants, etc. The moth flies in August and early September. It is generally distributed throughout the British Isles, and is abundant pretty well everywhere.

The Flame Shoulder (*Ochropleura plecta*).

This moth (Plate 110, Fig. 7) is also common, and generally distributed throughout England, Ireland, Scotland (mainland),

Pl. 114. *Q* 228

1, 2. **Barred Chestnut.** 3, 4. **Small Square-spot.**
5. **Six-striped Rustic.** 6. **Cousin German.**
7, 8. **Dotted Clay.** 9, 10, 11, 12. **Square Spot Rustic.**

Pl. 115.

Q 229.

1, 2. **Lunar Yellow Underwing.**
4, 5, 7, 8. **Lesser Yellow Underwing.**
3, 6. **Large Yellow Underwing.**

and Wales. The fore wings are usually purplish brown, but sometimes they are palish red brown ; the creamy stripe on the front margin is more or less sprinkled with scales of the ground colour, occasionally so thickly that these marks appear reddish in tint ; there is often a pale, wavy submarginal line, and in some specimens a dusky second line can be detected ; not infrequently there are traces of the claviform mark, but I do not remember ever seeing any indication of a first line. The hind wings are white, and frequently the fringes are pale pinky brown.

The caterpillar is brownish, varying from ochreous to reddish, freckled with darker; the broken lines on the back are pale, with dark edges, and there is a brown freckled, pale ochreous stripe along the sides ; the usual spots are black, and the spiracles whitish, edged with brownish ; head brown marked with darker. It feeds on various low plants, and also on lettuce, beet, etc., in gardens ; there are certainly two broods in most years, one in the summer and the other in the autumn. The moth is out in May and June, and again in August and September. Specimens have also been taken in July, and occasionally in April. The species has a very extensive range abroad, extending to India, Corea, Japan, and North America.

The Flame (*Axylia putris*).

This species, which is depicted on Plate 132, Fig. 13, is pretty constant in its pale coloration and darker markings. It is often common, and is widely spread throughout England, Wales, Ireland, and in Scotland up to Ross.

The caterpillar is greyish brown, mottled and dusted with blackish, chiefly so on the sides ; the central line is darker but indistinct, and there is a yellow spot on each ring ; a whitish line on each side of the central one is edged above with curved black dashes, and these are most distinct on rings four to ten ;

the eleventh ring is edged behind with ochreous ; head dark brown ; spiracles and raised dots blackish. (Adapted from Fenn) It feeds on hedge bedstraw (*Galium mollugo*), dock, plantain, nettle, and many other low plants ; also on lettuce. July to October. Generally the winter is passed in the chrysalis stage, and the moth comes out in the following June or July. Sometimes the moth has emerged in September.

The Lesser Yellow Underwing (*Triphæna comes*).

This very variable species, of which the typical forms and two varieties are represented on Plate 115, is to be found, often abundantly, almost everywhere in the British Isles, except the Shetlands.

Apart from a form peculiar to Scotland, which will be separately referred to, the colour range of the fore wings is from pale ochreous-brown to a deep brown ; in all shades there may be a tinge of reddish, or a suffusion of greyish. In Ireland and Scotland, and less frequently in England, a distinctly red form occurs. (Plate 115, Fig. 7.) Then there is variation in the markings, and more particularly in the reniform and orbicular marks ; both stigmata are, perhaps, rarely absent, but they are frequently very faint, and of the orbicular there is often not a trace. On the other hand, both may be filled up with dark brown, or blackish, and very conspicuous. The cross lines, and more especially the shaded submarginal, are usually pretty much in evidence, but these are apt to disappear entirely. The yellow hind wings are occasionally smudged with blackish towards the base ; the central crescents vary in size, and somewhat in shape, and although sometimes greatly reduced, they are only rarely quite missing ; the black band before the outer margin is also subject to modification in width and the regularity of its edges.

Var. *curtisii*, Newman, was discovered in the Isle of Bute by Curtis in 1825, but until 1871, when Newman gave it the name it now bears, it had been known as *consequa*, the name assigned to it by Curtis when figured by him in 1831. The form is generally rather smaller than the type ; the fore wings are rich reddish brown, clouded to a greater or lesser extent with blackish, and sometimes entirely suffused with that colour. The yellow ground of the hind wings is rarely quite free of black scales, but in some specimens they are so thick that the yellow is hidden. A specimen of this form is shown on Plate 115, Fig. 8. It is found in the Orkneys, Sutherlandshire, Elgin, Inverness, Aberdeenshire ; also in the Hebrides, and in the Isles of Bute and Arran.

The caterpillar (Plate 118, Fig. 2), is greenish ochreous varying to greenish brown ; three yellowish lines on the back, the central edged with blackish and the others with dark oblong marks ; spiracles white, edged with blackish, and below them an ochreous stripe ; head grey brown marked with darker. It feeds on grass and most low plants from September to April. The moth is out in July and August.

Abroad it occurs chiefly in Central and Southern Europe, but its range extends to Southern Scandinavia and eastward to Asia Minor and Armenia.

The Lunar Yellow Underwing (*Triphæna orbona*).

Two specimens of this species are shown on Plate 115 Fig. 1 represents a specimen from Forres, in Scotland, and Fig. 2 an example from the New Forest, Hants.

Although there is some variation in the colour of the fore wings (which ranges from pale greyish brown to dark reddish brown), and also in the intensity and clearness of the markings, this species is far less aberrant than that last referred to, and

from which it is at once separated by the black mark on the front margin, placed on the inner edge of the submarginal line. The caterpillar is distinguished from that of *comes* by the black-edged broader ochreous central line, and a series of black oblong spots on each side of it ; the stripe under the spiracles is broad, and ochreous. It feeds from September to April on grasses and various low plants. The moth flies in July and August. The species is widely distributed in Scotland, and occurs in Unst, the most northern of the Shetland Isles. In England it occurs, or has been found, in Durham, Yorkshire, Worcestershire (Malvern), Herefordshire, Gloucestershire, Oxfordshire, Norfolk, Suffolk (not uncommon in the "Breck" district), Surrey, Sussex, Wilts, Hants (rather commonly in the New Forest), and the Isle of Wight. For Wales, Barrett states that it is rare in Pembrokeshire ; and Kane mentions Co. Galway (four specimens), Killarney, and Lisbellaw for Ireland. The range abroad is somewhat similar to that of *comes*, but it extends further north in Scandinavia.

The Large Yellow Underwing (*Triphæna pronuba*).

The colour of the fore wings of this common, and often abundant, species ranges through various shades of brown to dark purplish. In the typical form (Plate 115, Fig. 3), the wings are of the paler shades, mottled with darker, and the thorax, except the pale front, agrees in colour with the darker mottling of the wings. Fig. 6 shows the plain form (var. *innuba*, Treitschke), and it is in this form that the darkest colours appear ; the thorax is always of the wing colour, and without the pale front. The black mark at upper end of the submarginal line is rarely absent, but I have a pale reddish-brown example of the *innuba* form without the mark. In the black-bordered yellow hind wings a central crescent is very

exceptional, but specimens in which it is more or less evident are not unknown.

The eggs figured on Plate 118 were found in August, 1906, on a leaf of gladiolus in the garden. When first noticed they were of a pale creamy-white colour, but two days afterwards the upper half of the batch became purplish grey, and the caterpillars hatched out the following morning, when the other half had also changed colour, and the larvæ hatched next day.

The caterpillar (Plate 118, Fig. 1), is obscure brownish, sometimes ochreous or green tinged; with ochreous lines on the back, the outer ones edged with blackish bars on rings four to eleven; head pale brown marked with darker. It feeds from August to May on grasses and low plants, and is often a pest in the flower or vegetable garden. When eggs are obtained early, the caterpillars from them will sometimes attain the moth state in the same year. The moth flies in June and July, and has occurred in April, September, and October.

The Broad-bordered Yellow Underwing
(*Lampra fimbria*).

This is another species with variable coloured fore wings, and four examples of it are shown on Plate 116. Pale ochreous brown and greyish brown is the most frequent colour, but various shades of greenish or olive brown are not uncommon. A dark reddish-brown form, known to collectors as the "mahogany form," seems to be somewhat rare. In the majority of specimens the basal third, and more or less of the central area adjacent to the second line seems to be the darkest coloured; but occasionally these parts are pretty much of the same tint as the rest of the wings.

The caterpillar (Plate 118, Fig. 4) is of a soft ochreous brown, sometimes red tinted, minutely dotted with blackish; the central line on the back is pale, and on each side are darkly-edged pale

oblique streaks; the white spiracles are followed by blackish marks; head brown freckled with darker. It feeds in the autumn on primrose, violet, dock, etc., and in the spring it seems to prefer the buds and young leaves of birch, sallow, bramble, hawthorn, sloe, chestnut, etc. The chrysalis, which also is figured, is dark reddish-brown, with two short anal spikes.

This species occurs in June and July, and frequents woodland localities throughout England, Ireland, Scotland (up to Moray), and Wales.

The Lesser Broad-border (*Triphæna janthina*).

Fore wings violet or purplish grey with blackish cross bands and brownish suffusion, the latter more especially on the basal area; reniform and orbicular stigma outlined in whitish. (Plate 116, Fig. 3.) In another form the bands and suffusion are reddish-brown. The black clouding on basal area of hind wings sometimes extends further towards the marginal band. The caterpillar (Plate 118, Fig. 3) is of a greenish tinged ochreous brown colour, with a pale central line and series of dusky dashes along the back, these dashes becoming blackish on the hind rings; the white spiracles are set in a blackish mark, and under them is a pale ochreous stripe. It feeds in the autumn on primrose, bramble, dock, etc., and in the spring on the young growth of sallow, elm, hawthorn, etc. The moth flies in July and August, frequenting lanes, hedgerows, and woods. It is pretty generally distributed throughout England, Wales, Ireland, and Scotland as far north as Moray.

The Least Yellow Underwing (*Triphæna interjecta*).

Fore wings, dull reddish brown with darker cross lines and shades, often faint. On the inner margin of the yellow hind wings, two dusky shades run from the border to the base; these

are not infrequently as black as the border, which is often broader than in the specimen shown on Plate 116 (Fig. 4). The caterpillar is ochreous brown dotted with black; on the middle of the back is a brown stripe enclosing a whitish central line. A brown stripe along the sides is edged above with whitish; the head is pale ochreous brown lined with darker. Stated by Barrett to feed on grasses and low plants, or, in the spring, on young shoots of sallow; said also to eat primrose and dock. September to May. The moth is out in July and August, and affects lanes and hedgerows. I have found it more frequently on flowers of ragwort, and on "honey-dew," than on the sugar patch; but have met with it occasionally darting along some particular bit of hedgerow, in the late afternoon. Although apparently uncommon in the Midlands, it occurs more or less freely throughout England to Durham. In Ireland it has been found in counties Dublin, Wicklow, Waterford, Cork, Louth, Westmeath, Galway (Kane), and, Barrett adds, Antrim. Also in Kildare and Kerry (D'onovan).

The Green Arches (*Anaplectoides prasina*).

This moth is shown on Plate 117. When quite fresh the ground colour of the fore wings is a beautiful green, but this often fades after a time, and the wings then assume an ochreous hue. The cross lines are black relieved with whitish, and there is a whitish blotch on the second line touching the outer edges of the reniform stigma. The green colour varies in tint even when the insects are alive; and the black markings differ in intensity, being much stronger in some specimens than in others. The caterpillar is greyish brown, more or less tinged with violet; there are three fine whitish lines, and a series of blackish diamond-shaped marks on the back; the spiracles are white, and there is an ochreous stripe below them. It feeds on dock and other low plants, bramble, and in the spring on sallow shoots and the young growth of bilberry. July to April, or May.

The moth, which frequents woods, flies in June, but has been reared, as a second generation, late in the year. The species seems to be pretty generally distributed over England and Ireland, and is often common, especially in the south and east of the former country. From the Midlands northwards it appears to be less common, and its range more restricted. In Scotland it has been recorded from Roxburghshire (common at sugar in 1898), the Clyde district, and, Barrett adds, Perthshire.

The Great Brocade (*Eurois occulta*).

On Plate 117, Fig. 3 represents the typical grey form of this species, and Fig. 4 the black var. *passetii*, Thierry-Mieg. Intermediates occur connecting the melanic form with the type, and sometimes specimens are found of a paler hue than the type. Bred specimens occasionally have a rosy tinge, and this is then usually most in evidence between the first and second cross lines. The caterpillar is brown, with three ochreous lines on the back, the outer with dark oblique dashes on each ring; a whitish stripe along the spiracles is blotched with reddish, and edged above with black. It feeds in the autumn on dock, plantain, primrose, dandelion, etc., and in the spring on bramble, bilberry, sallow, heather, and birch, among other things. Usually it hibernates when small, but when kept indoors, and fairly warm, it can be induced to complete growth, and attain the moth state in October or later, sometimes even earlier. In the open the moth flies from the end of June to August.

Scotland appears to be the British home of the species, and it is found in most woods throughout that country, including the isles, but it is rare in the Shetlands. It occurs in Durham (rare), and in Yorkshire was not uncommon at Everingham in 1897, and several were obtained at Middlesbrough in 1900. Further south its occurrence is even more casual, and the most recent captures I have any note of are, two specimens in

Pl. 116. *Q* 236.

1, 2, 5, 6. **Broad-Bordered Yellow Underwing.**
3. **Lesser Broad-Bordered Yellow Underwing.**
4. **Least Yellow Underwing.**

Pl. 117.

1, 2. **Green Arches.**

3, 4. **Great Brocade.**

5. **Silvery Arches.**

6. **Pale Shining Brown.**

Q. 237.

Lincolnshire, August, 1896, North East London, August, 1900, Kensington, 1937. Also recorded from Norfolk, Suffolk, and Essex. Only two specimens are known from Ireland.

The range abroad extends to Amurland, Corea, and to North America.

The Silvery Arches (*Polia tincta*).

The moth represented on Plate 117, Fig. 5, has the fore wings silvery grey clouded with brownish on the central area; or occasionally spreading over a larger portion of the wings, and sometimes purplish in tint. The caterpillar is brownish inclining to reddish, clouded on the back with paler and darker brown. The central line, which has a broken blackish edging, is only distinct on the front rings. Spiracles black; head pale brown marked with darker brown. In the autumn it feeds on low plants such as dock, plantain, etc.; but in the spring it is found at night on the young growth of birch and sallow bushes, and more rarely on hawthorn, and I believe, on bilberry. The moth which occurs in birch woods in June and July, is not uncommon in the south of England from Essex to Hampshire, and has been found in Dorset and Devonshire. It has also been obtained more or less frequently in Berkshire, Oxfordshire, Cambridgeshire (once), Huntingdon, Worcestershire (Wyre Forest and Malvern), Staffordshire (north), Lancashire (Witherslack), Yorkshire (Huddersfield, once), and Westmoreland. In Scotland it ranges on the west from Ayr to Argyllshire, but although local is more frequent in Perthshire, Moray, and Sutherland. Var. *obscurata*, Staud., is a form of this species occurring in Amurland and Southern Siberia.

The Pale Shining Brown (*Polia advena*).

This moth (Plate 117, Fig. 6) is pale reddish brown and glossy, especially on the outer area, on the fore wings. The caterpillar

is pale ochreous brown above, and inclining to greenish below; three dark-edged pale lines, and a series of dark diamond-shaped marks on the back. The usual dots are whitish encircled with blackish, and the blackish edged spiracles are reddish brown; head olive brown, and plate on first ring blackish with the three lines showing distinct. From July to September it feeds on various low plants, including rest-harrow, dandelion, and knot-grass, also on broom, bilberry (Barrett); and Newman mentions sowthistle (*Sonchus*) and lettuce. In confinement the moth sometimes emerges in the autumn, but in the open it flies in June and July. Flowers seem to have more attraction for it than sugar. I have taken it at the blossoms of wood sage, white campion, and woundwort (*Stachys*), and Barrett notes, bladder campion, viper's bugloss, and the martagon lily. The species is chiefly found, as regards England, in the southern and eastern counties; and in the Solway, Clyde, Forth, and Tay districts of Scotland. Louth is the only Irish county from which it has been reported. The range abroad extends to Amurland. In North America the species is represented by var. *purpurissata*, Grote.

The Grey Arches (*Polia nebulosa*).

Grey of some shade is the more general hue of this species, but it varies in the West of England and in Ireland to white (var. *pallida*, Tutt), and this form is shown on Plate 119, Fig. 3. In Cheshire (Delamere), Lancashire (Warrington), and South Yorkshire black or blackish forms occur, and two examples of this melanic race are portrayed on the plate, Fig. 4 being var. *robsoni*, Collins, and Fig. 5 var. *thompsoni*, Arkle. Over the greater part of England, and in Scotland, the greyish form is most frequently met with, but the white form has been found in Argyllshire and in Sutherland. The caterpillar is ochreous brown or brownish grey, with a series of diamond-shaped blackish marks, and a pale central line, on the back;

the dots and the spiracles are black, each of the latter with a blackish streak in front of it. In the autumn it feeds upon dock and other low plants; but in the spring, when it is more easily found, the caterpillar eats the buds and young leaves of birch, oak, sallow, bramble, etc. The moth is out in June and July, and is not uncommon in woods. The black form seems to be peculiar to north England. In Amurland the species is represented by var. *askolda*, Oberthür, and in North America by var. *nimbosa*, Guenée.

The Cabbage Moth (*Mamestra brassicæ*).

The darker markings of this very common greyish moth are often very obscure, but the white outline of the reniform stigma, and the white submarginal line are usually distinct. The caterpillar varies in colour, but generally is some shade of dull brown or greenish, with the usual dots greyish or green tinged. The central line on the back is dusky, speckled with white, and the stripe low down on the sides is yellowish, greenish, or dingy brown; head ochreous brown marked with darker or greenish. Although it is exceedingly partial to the cabbage and other plants of the kind, it will feed upon almost every sort of low herbage, wild or cultivated. Barrett states that it has been found feeding on oak. I have taken it from birch in the garden, and it is known to eat leaves of almost any tree or shrub that may be offered to it in confinement. July to October. The moth is out in June and July, and sometimes there is an emergence in September. The species occurs over the whole of the British Isles, and abroad its range extends to India, Amurland, and Japan. (Plate 120, Figs. 3 ♂, 6 ♀.)

The Dot (*Melanchra persicariæ*).

The striking feature of the bluish-black moth shown on Plate 120, Figs. 1, 2, is the brownish centred white reniform

stigma. Except that the yellowish submarginal line is sometimes obscured, the species is very constant in the British Isles. Abroad, a form without the white mark is known as *unicolor*, Staud., and one or two examples have been recorded as occurring in England, two in 1895 said to have been reared by a northern collector from caterpillars obtained in the London district. The caterpillar figured on Plate 129, Fig. 2, was pale green with darker green markings. In another form the colour is pale brown with the markings darker brown. It is found from August to October on all sorts of low plants, and in the garden, where it is often common in the suburbs of London, is very fond of the foliage of *Anemone japonica* and lupin, among other plants. The moth is out in July and August, but is not often common north of the Midlands, though it occurs, or has been found in almost all the counties of England. Its occurrence in Scotland seems to be doubtful, and Donovan states that in Ireland it is local and not common generally. Its range abroad extends to China and Japan.

The White Colon (*Heliophobus albicolon*).

Two specimens of this species are shown on Plate 120, Figs. 7, 8. It will be noted that, except for the two white dots at the lower outer edge, the outline of the reniform mark is very obscure; these dots are placed one below the other, thus forming a :, hence the English name of the moth. Blackish specimens have been obtained on the east coast of Scotland.

The caterpillar is green or bluish grey, with a dark-edged pale central line; spiracles white, margined with black. Barrett states that it feeds in June and July, and probably as a partial second generation in September, on plantain, dandelion, and other low plants growing in sand; probably also on *Atriplex*, *Chenopodium*, and Cruciferæ; but it is a larva of secret habits and is very little known.

Pl. 118. *Q* 240.

1, 1*a*. **Large Yellow Underwing**: *eggs and caterpillar.*
2. **Lesser Yellow Underwing**: *caterpillar.*
3, 3*a*. **Lesser Broad-border**: *caterpillar and chrysalis.*
4, 4*a*. **Broad-bordered Yellow Underwing**: *caterpillar and chrysalis.*

Pl. 119.

Grey Arches Moth *and varieties.*

R 24[1].

The moth, which flies in May and June, and again in July and August, frequents sandhills on the west, especially those of Yorkshire, Lancashire, Cheshire, and Wales. In Norfolk and Suffolk it is found in the Breck Sand district as well as on the coast, and it also occurs on the coasts of Dorset, Somerset, Devon, and Cornwall, but seems to be uncommon in most of these counties. In Scotland it occurs in suitable parts of the east coast to Aberdeen, and on the west coast to the Clyde. In Ireland on the coasts of Kerry, Louth, Derry, and Donegal.

The Bright-line Brown-eye (*Diataraxia oleracea*).

The English name of this very common moth (Plate 120, Figs. 4, 5), applies to the majority of specimens, but now and then the ochreous, or yellow reniform stigma, referred to as the brown eye, is blurred and indistinct, and the white submarginal line may almost disappear. The ground colour of the fore wings ranges from reddish or purple brown to dark brown. The caterpillar (Plate 129, Fig. 1), varies from green to light brown, sometimes the brownish forms are tinged with pink ; the body is minutely dotted with white, and the usual dots are black ; the spiracles are white, margined with black, and placed on the blackish edge of a yellow stripe ; there are three greyish, but frequently indistinct, lines on the back. It feeds from July to September on most low plants, and is often found in abundance under spreading clumps of goose-foot (*Chenopodium*), and has been noted in profusion upon tamarisk growing by the sea. The moth flies in June and July, sometimes in the autumn. Except, perhaps, in the Hebrides, it has been found throughout the British Isles. (See Appendix.)

The Light Brocade (*Hadena w-latinum*).

The moth portrayed on Plate 121, Fig. 1, is not given to much variation. The central area enclosed by the cross lines is

more or less clouded with reddish or purplish brown, not extending, as a rule, below the black bar between the lines, but sometimes the inner area is clouded with purplish from the second cross line to the base of the wing. The caterpillar is pale olive greenish above, with brownish and blackish diamonds or V-shaped markings ; three lines on the back are dark-edged but indistinct ; a cloudy line along the white spiracles. The colour varies from greenish to brownish grey or purplish brown, and all shades may occur in the same brood. It feeds in July and August on broom, dyer's greenweed (*Genista tinctoria*), persicaria, and other low plants. The moth is out in May and June, and may be seen in the daytime on palings and other kinds of fencing, and also on tree trunks. It occurs in England from Worcestershire and Northampton southwards, but seems to be rarely met with northwards. Four or five specimens were taken at electric light near Tarporley, Cheshire, about 1900 (Day's List). It has been recorded from Ayr, Argyll, and Paisley in Scotland, but its occurrence in Ireland is doubtful. The distribution abroad ranges to Eastern Siberia.

The Dog's Tooth (*Hadena suasa*).

The example of this species shown on Plate 121, Fig. 2, is of the reddish-tinged pale brown form from Essex ; but in that county, and also in other parts of England, the fore wings are sometimes clouded with sooty-brown. In other forms the fore wings are purplish or reddish brown, and the markings may be very distinct, or much obscured. The caterpillar is greenish or brown, minutely dotted with white, and freckled with dark greyish ; the usual dots are black ; there are indications of darker lines on the back, but these are not always clearly defined ; the white spiracles are set in the black interrupted edge of a yellowish stripe. It feeds in July and August, on dock, plantain, etc. The moth flies in June and

Pl. 12c. *R* 242

1, 2. **Dot Moth.**
3, 6. **Cabbage Moth.**
4, 5. **Bright-line Brown-eye.**
7, 8. **White Colon.**

Pl. 121. *R* 243.

1. **Light Brocade.** 2. **Dog's Tooth.** 3, 4. **Dark Brocade.**
5. **Beautiful Arches.** 6. **Beautiful Brocade.** 7. **Pale Shouldered Brocade.**

July, and occasionally in the autumn. Its haunts are marshy places, especially on the coast, and mosses ; and it is found in most of the seaboard southern and eastern counties, and more rarely inland. Recorded from Ayr and Kirkcudbright in Scotland ; is widely distributed in Ireland, and not rare in Louth and Kerry.

The Pale-shouldered Brocade (*Hadena thalassina*).

The whitish or creamy-white patch at the base of the reddish-brown fore wings is a noticeable feature of this moth (Plate 121, Fig. 7), and is almost always present, even when the wings are darkened and the other markings more or less obscured. The W-like angles of the white submarginal line run through to the fringes. In some specimens the general colour is purplish brown, and in others greyish brown. The caterpillar is greyish-brown with a slight reddish tinge, and freckled with darker brown ; the usual dots are black ; central line dusky, a series of darker oblique dashes on each side of it ; the line along the spiracles is rather broad and sometimes edged above with blackish. It feeds in August and September on dock, groundsel, honeysuckle, broom, sallow, hawthorn, apple, etc. The moth is out in June, earlier or later according to the season ; sometimes it appears again in August or September. It may be found, commonly as a rule, in most woods over the greater part of the British Isles.

The Beautiful Brocade (*Hadena contigua*).

The moth (Plate 121, Fig. 6) has a pale patch at the base of the fore wing, but this is not so conspicuous as is the pale orbicular stigma, which is often united with a pale mark at its lower edge ; another pale patch lies at the inner angle, and the whole area between the second cross line and the clouding on

the outer margin may be pale. Sometimes these pale markings are tinged with pink, and more rarely the whole surface is pinkish suffused. The caterpillar is yellowish-green with reddish V-shaped marks on the back ; a yellowish line along the black-margined white spiracles. Buckler figures a reddish-brown form, with a yellowish stripe below the spiracles. It feeds in August and September on birch, oak, golden rod, bog myrtle (*Myrica gale*), dock, brake-fern (*Pteris aquilina*), etc. The moth appears in June, and may sometimes be seen in the daytime on tree trunks or palings. It is a woodland species, but although it occurs in most southern and eastern counties, it is not common in any of them ; it becomes commoner in the Midlands, but is scarce in, or absent from, the northern counties of England, and in Wales. In Scotland it is more frequent in some localities from Argyll to Ross. Kane notes it as local, and sometimes abundant, but from the localities given it would seem to be widely distributed in Ireland. The range abroad extends through Northern Asia to Japan.

The Broom Moth (*Ceramica pisi*).

The moth shown on Plate 122, Figs. 1, 2 varies considerably, in the colour of the forewings ranging from purplish red to dingy ochreous brown or greyish brown. The cross lines and occasionally the stigmata and shades may disappear, but the yellow submarginal line always remains, at least in part. The caterpillar (Plate 129, Fig. 3) feeds on the foliage of a variety of plants including brake fern or braken, sweet gale, broom, bramble, wild rose, and sallow, and may be found, often in the daytime, in August and September. It is usually of some shade of green or brown, occasionally blackish, with yellow stripes. The moth is out in June and July and is more or less common almost throughout the British Isles. The range abroad extends to Amurland. Donovan has named a brown Irish form ab. *kanei*.

Pl. 122.

R 244

1, 2. **Broom Moth.**
5, 6. **Glaucous Shears.**
10. **The Stranger.**

3, 4. **Nutmeg Moth.**
7, 8. 9. **Shears Moth.**
11, 12. **Brindled Green.**

Pl. 123. *R* 245.

1, 4. **Northern Arches Moth.**
2. **Barrett's Marbled Coronet.**
3. **North Arches Moth,** *var. assimilis.*
5. **Grey Moth.**
6. **Marbled Coronet.**
7, 8. **Marbled Coronet,** *vars.*

The Nutmeg (*Hadena trifolii*).

The fore wings of this species (Plate 122, Figs. 3, 4) are usually greyish brown variegated with darker: cross lines pale with black edging. Sometimes the general colour is tinged with ochreous. The caterpillar is green with a darker central and two whitish lines on the back, the outer lines with black marks on them; a white edged pinkish stripe along the black-margined white spiracles. It feeds from July to September, sometimes earlier or later, on goose-foot, orach, beet, and other Chenopodiacæ, and has also been found on young leaves of onion. The moth is out in May and June, and as a second generation in late July and August. In 1903 a specimen was taken, at Boscombe, on March 21. The species is more especially attached to the coast, but is plentiful in the Breck Sand district of Norfolk and Suffolk, in market gardens and waste places around London, and is found more or less frequently up to Staffordshire. In Cheshire and Yorkshire it is scarce. Barrett states that in Scotland it is found rarely in Roxburghshire and Aberdeenshire; and not very uncommonly in the Clyde Valley; it is, however, not mentioned in the list of the lepidoptera of the Clyde area published in 1901. Only three specimens have been recorded from Ireland. The range abroad includes Northern Asia, Canada, and the United States of America.

The Glaucous Shears (*Hadena glauca*).

Noticeable features of this dark-clouded whitish grey species (Plate 122, Figs. 5♂, 6♀) are the whitish, or whitish outlined, stigmata; and the conspicuous black wedges on the inner edge of the pale submarginal line. The ground colour is sometimes purplish tinged; the dark clouding may spread over the greater part of the fore wings. The caterpillar is dark red brown with darker freckles, a whitish central line, and two

series of dusky dashes; a paler line along the black-edged white spiracles; head pale brown freckled with darker. Feeds in July and August on heather, sallow, bog myrtle, etc., and will thrive on lettuce. The moth is out in May and June, and may be found resting by day on tree trunks, fences, or rocks. This species in England occurs chiefly in hilly districts of the northern counties from Staffordshire to Cumberland; recorded from Glamorgan. In Scotland it is widely distributed from Ayr to Ross, and is also found in the Hebrides and the Orkneys; and in Ireland is obtained in several of the northern counties, and on the Hill of Howth. The range abroad extends to Amurland.

The Shears (*Hada nana*).

The ground colour of this species, three specimens of which are shown on Plate 122, Figs. 7, 8 ♂, 9 ♀, ranges from the normal pale grey through various shades of brownish grey. The markings, usually well in evidence, are sometimes obscured in the darker specimens. The caterpillar is brownish with three white lines and a series of grey-brown diamond-pattern blotches on the back; the outer lines with blackish spots upon them; the stripe along the black spiracles greyish; head pale brown marked with blackish; plates on first and last rings of the body glossy. Feeds in July and August on dandelion, knotgrass, chickweed, hawk's-beard (*Crepis*), hawkweed (*Hieracium*), etc. The moth flies in May and June and appears to be found throughout the British Isles. Represented in Siberia by the dark form *latenai*, Pierret.

The Stranger (*Hadena blenna*).

This species, which is an inhabitant of Asia Minor, Southern Russia, Turkey, Dalmatia, and Northern Italy, occurs in Southern, Western, and Northern France; and three specimens

have been recorded as taken in England—all at Freshwater in the Isle of Wight—the first in 1858, the second in 1859, and the third about 1876. The specimen depicted on Plate 122, Fig. 10, was received from abroad.

Barrett's Marbled Coronet (*Hadena barrettii*).

This species, which was first taken at Howth, Ireland, in June, 1861, by the late Mr. C. G. Barrett, was originally described by Mr. Doubleday on p. 24 of the Entomologists Annual for 1864. (Plate 123, Fig. 2, represents a specimen kindly lent by Mr. R. Adkin.) It is distinct from *H. luteago* with which species it has often been confounded, but is closely related to *H. andalusica.* In 1879 a specimen was taken on the coast at Ilfracombe, North Devon; one example was reared from a caterpillar found at Tenby, South Wales, in 1884, and one was captured in Carnarvonshire, North Wales, in 1897. In the last mentioned year specimens were taken by the late Major Ficklin on the coast of Cornwall, and as the Cornish form differs from the Irish form in being grey instead of brown, it has been named var. *ficklini*, Tutt. A second specimen was obtained in North Wales in 1899. Since its first detection at Howth the insect has been taken in limited numbers almost every year; and in 1906 Major C. Donovan recorded it as widely distributed along the coast of Co. Cork, the specimens being large, of a dark slate colour with distinct light whitish grey markings. He has named a dark brownish grey form *turbata.*

The caterpillar is pale ochreous with a pinkish tinge; the central line is greyish brown and the spiracles black; head reddish brown marked with darker. It feeds on the roots of sea campion and rock spurry, July to September. The moth flies from June to August. Like most of the species in this genus, it does not care for the collector's sugar, and except that an occasional

specimen may be found resting on the rocks, the moths must be netted as they fly at dusk to the flowers of *Silene*.

The Grey (*Hadena cæsia*).

The obscurely marked slate grey insect shown on Plate 123, Fig. 5, was first found at Tramore, Ireland, and in the Isle of Man about the same year (1866 or 1867). Kane mentions that he has found the insect at Tramore, and also in eleven other localities on the rocky coast line of the South of Ireland, from Hook Point to Dingle Bay. Our form of the species, var. *manani*, Gregson, differs from the greyish blue continental type in its darker coloration, and this is intensified in the south-west corner of Ireland where specimens of a uniform bluish black occur.

The caterpillar is pale ochreous brown minutely freckled with darker; the lines on the back are blackish, but indistinct; usual dots margined with black; head pale brown, marked with darker. It feeds on the buds, flowers, and seeds of campions (*Silene maritima* and *S. inflata*) from June to August. The moth flies in June, July, and early August, and may be taken, like the last species, at the flowers of the campions growing on the rocks in its seaside haunts.

The Marbled Coronet (*Hadena conspersa*).

Three forms of this locally variable species are shown on Plate 123. Fig. 6 represents the typical form occurring generally in England, but in North Devonshire, on the coast, specimens are found closely approaching the Isle of Lewis form (Fig. 7), whilst others from that district agree in the blackish ground colour with specimens from Ireland. A still darker

race occurs in the Shetland Isles, and chiefly on the east coasts, whence came the specimen depicted (Fig. 8). On the western sides of the Shetlands, Mr. McArthur found the species to be rather more typical as a whole, although some specimens approached the darker eastern form. The dark Shetland race has been named var. *hethlandica* by Staudinger, and the form with the white markings yellowish tinged is var. *ochrea*, Gregson.

The caterpillar is pale ochreous brown ; the back sprinkled with darker, and forming still darker V-shaped marks, central line pale ; spiracles ochreous with black outlines, set in the upper edge of a pale stripe ; head shining pale yellowish-brown freckled and lined with darker. It feeds on the seeds of catch-fly, campion, and will eat those of sweet-william and garden pinks. July to September. The moth is out in June and July, and at dusk visits the flowers of its food plants, and occasionally comes to sugar. It is chiefly found in the seaboard counties, but as regards England is commoner in the south than in the north. Although generally rare in the inland counties, it is sometimes not uncommon in some Surrey localities, such as the Croydon district, and Mr. Scollick has reared moths from caterpillars found in seed capsules of white campion at Horsley.

The distribution of this species extends to Amurland.

The White Spot (*Hadena albimacula*).

The moth shown on Plate 124, Fig. 1, is "The Beautiful Coronet" of some writers. Although a specimen was taken in Kent in 1816, nothing further was heard of the species in England until 1865, when one example was captured in the Portsmouth district. Then in 1873 caterpillars were found in the Birchwood locality where the first moth was secured. The next year the species was found to occur at Folkestone, and subsequently at other places along the Kentish coast. Since

1889 it has been obtained, not uncommonly, at Seaton on the South Devon coast. The caterpillar, which is somewhat similar to that of the last species, feeds in July and August on the seeds of the Nottingham catchfly (*Silene nutans*), but will thrive on those of other kinds of catchfly, campion, or even sweet-william and garden pinks. The moth flies in May and June.

The Varied Coronet (*Hadena compta*).

In Europe this species has a less northerly range than *D. conspersa*, and its eastward range extends to Japan. The caterpillar feeds on the seeds of *Dianthus*.

Very few specimens have been recorded for the British Isles. Two are in the Tardy collection at Trinity College, Dublin, and Donovan mentions one in Westropp's collection. There are three specimens in the British Museum, one from Lewes, bred 1921 (Adkin), one S. Devon, June, 1878 (A. B. Farn), and one purchased in 1871 from E. G. Meek. The specimen represented on Plate 124, Fig. 2, is from the Continent.

The Lychnis (*Hadena bicruris*).

Except that the brown ground colour is sometimes of a reddish shade, or greyish in tone, there is not much to notice in the variation of this species. Occasionally the outlines of the reniform and orbicular marks are usually white and distinct, and now and then the black markings are intensified. Two specimens are shown on Plate 124, Figs. 3 ♂, 4 ♀. The caterpillar is brownish ochreous freckled with darker, and with a pale central line and a series of dusky V-shaped marks on the back; a paler stripe along the whitish spiracles; head pale reddish brown, marked with darker brown. It feeds in July, sometimes in September, on campion, ragged robin, catchfly, and sweet-william and pinks. Fig. 3, Plate 130, is from a coloured drawing

by Mr. A. Sich, and represents the caterpillar, as seen when making the sketch, holding a seed between its front pair of legs and up to its mouth. The moth is out in May and June, and in some years there is a second flight in the autumn. The species is more or less common over the greater part of the British Isles.

The Campion (*Hadena cucubali*).

This moth (Plate 124, Figs. 5 ♂, 6 ♀) is very similar to the last, but it has a distinct violet tinge, the orbicular mark is lengthened, and its lower edge touches, or almost touches, the reniform ; the second line is distinct and straighter above the inner margin. The caterpillar is greenish, tinged with orange-brown on the front rings ; the central line is greyish-brown, and the V-marks on the back and oblique stripes low down on the sides are orange-brown. It feeds on the leaves as well as the unripe seeds of campion, ragged robin, and catchfly in July, August, and September. The moth is out in June, and examples of a second generation in August. Like the rest of the species of the genus, it is most partial to flowers, but it occasionally puts in an appearance at the sugar patch. Pretty generally distributed over the British Isles. The range abroad extends to Amurland, China, and Japan.

The Tawny Shears (*Hadena lepida*).

This species ranges in the colour of the fore wings from almost white, through various shades of ochreous brown.

The white and ochreous-tinted specimens are found in Kent and Sussex chiefly, whilst the ochreous-brown forms are more generally distributed in England. Barrett states that in the south of Scotland a form occurs in which the ground colour is very pale dull brown with all the darker markings and cloudings deep umberous, the cloudings more extended. Var. *capsophila*

(The Pod Lover), which represents the species in Ireland and the Isle of Man, is of a greyish coloration and lacks the ochreous tint; the dark markings, especially on the area between the first and second cross lines, are blackish or black, and the outlines of the stigmata are very distinct. Kane mentions dull black specimens, from the Blasket Islands, in which only vestiges of the stigmata and submarginal line remained clear. Pembrokeshire specimens have a colour range intermediate between *lepida* (Plate 124, Fig. 9) and var. *capsophila* (Figs. 7, 8), and serve to connect one with the other. The caterpillar, which is purplish brown with rather broad ochreous-brown lines on the back, feeds in June and July and again in September, on seeds of catchfly, campion, and sweet-william. The moth flies in May and June, sometimes in late July and August.

The Viper's Bugloss (*Anepia irregularis*).

The earliest British specimen of this moth (Plate 125, Fig. 1) of which there is any clear record is that found by the late Rev. A. H. Wratislaw, in July, 1868, resting on viper's bugloss (*Echium vulgare*), in a locality about ten miles from Bury St. Edmunds. Subsequently Tuddenham was indicated as the locality, and there, as well as in other parts of the Breck Sand district of Suffolk and Norfolk the species continues to flourish. *Echium* was at first supposed to be the food plant, but it was soon ascertained the larval pabulum was the flowers and seeds of the local catchfly (*Silene otites*). In September, 1870, Mr. Porritt described the caterpillar, and he found that in confinement it did not object to Ragged Robin (*Lychnis flos-cuculi*) in place of the *Silene*.

In colour the caterpillar is pale yellowish brown, tinged with green; three more or less distinct pale lines, and a series of smoke-coloured V-shaped marks on the back. Spiracles black with a yellowish white stripe below them, and a smoke-coloured

Pl. 124. *R* 252.

1. **White Spot Moth.** 2. **Varied Coronet.**
3, 4. **Lychnis.** 5, 6. **Campion.**
7, 8. **Pod Lover.** 9, 10. **Tawny Shears.**

Pl. 125. *R* 253.

1. **Viper's Bugloss.** 2. **Small Ranunculus.**
3, 4. **Broad-barred White.** 5, 6. **Minor Shoulder-knot.**
7, 8. **Minor Shoulder-knot** *varieties.*

one above ; head wainscot brown dotted with black. It may be found on its food plant from late July to early September. The moth flies in June and July, but seems to have been very rarely met with in the open, although large numbers of the caterpillars, which are frequently "ichneumoned," are collected almost every year. A specimen, recently presented to the Lincoln Museum, is said to have been reared from a caterpillar found on viper's bugloss in the neighbourhood of East Ferry in North Lincolnshire.

The Small Ranunculus (*Hadena dysodea*).

Except that the general grey coloration of the fore wings of this moth (Plate 125, Fig. 2) may be whiter or of a darker grey tint, there is little in the way of variation to refer to. Usually the area between the cross lines is dark grey, sometimes marked with yellow on the reniform and towards the inner margin. A series of yellow dots on the submarginal line is almost always present, but may be absent. The caterpillar is pale reddish brown ; three fine double blackish lines and two rows of black dots on the back ; a fine blackish line along the black spiracles. Head pale brown and glossy. In another form the general colour is some shade of green ; yellowish to olive. It feeds in July and August on the flowers and seeds of the wild lettuce (*Lactuca saligna*, and *L. virosa*), hawk's-beard (*Crepis*), and also on those of the garden lettuce. The moth is out late in June and July, and at dusk may be seen at the blossoms of various plants in gardens and elsewhere, but seems to be most partial to those of spur-valerian (*Centranthus ruber*). It is found in the eastern counties, especially in Cambridgeshire ; Surrey, and (rarely) in Sussex and Dorsetshire. Other English counties in which it has been noted are Hertford, Huntingdon, Northampton, Oxford, Berks, Somerset, Hereford, and Essex. It has not been reported since 1918.

The Broad-barred White (*Hadena serena*).

Most of the British examples of this species have the thorax and fore wings almost pure white, the latter with a central blackish grey band (var. *leuconota*, Ev., Plate 125, Figs. 3 ♂, 4 ♀). The white, however, especially on the outer margin, is sometimes clouded with greyish, and occasionally the ground colour has a greyish tinge, thus approaching var. *obscura*, Staudinger. The caterpillar is ochreous brown, more or less tinged with green, minutely dotted with dark grey, forming indistinct blotches ; the stripe along the black spiracles is yellow tinged with green below. Head brownish, glossy. It feeds in July and August on hawk's-beard (*Crepis*). The smaller caterpillars may be found by day resting on the yellow flowers. In confinement they will eat the flowers and seeds of garden lettuce ; and Prout mentions dandelion blossoms, and also those of almost any of the Compositæ. The moth is out from June to August, and in the daytime may be seen sitting on fences, tree trunks, rocks and walls. It is pretty generally distributed in the southern portion of England, but becomes scarce northwards. In Scotland it seems to be little known, but Renton records it as common in Roxburghshire, and in 1898 Mr. Kirkaldy kindly gave me three greyish-shaded specimens that he picked up casually at Pitlochry, Perthshire, in July of that year. It has been found in North Wales, but is more frequent in the southern parts of that country. Rather local and usually scarce in Ireland; but has been found in counties Waterford, Dublin, Wicklow, Louth, Antrim, Westmeath, Galway, Cork, and Kerry. The range abroad extends to Siberia and Amurland.

The Bordered Gothic (*Heliophobus reticulata*).

The cross lines and the veins are pale brown, sometimes tinged with pink. These markings give the moth (Plate 126,

Pl. 126. *R* 254.

1, 2. **Bordered Gothic.** 3, 4. **Dusky Sallow.**
5. **Orache Moth.** 6, 7. **Saxon Moth.**

Pl. 127. *K* 255.

1, 2. **Figure of Eight Moth.**
5. **Green Brindled Dot.**
8, 9. **Antler Moth.**
3, 4. **Feathered Gothic.**
6, 7. **Beautiful Gothic.**

Figs. 1 ♂, 2 ♀) a netted appearance, which, apart from the different ground colour and clouding, distinguishes it from the Gothic, with which it is sometimes confused. The antennæ, too, of the male are only fringed with minute hairs, whilst those of the male Gothic are broadly pectinated. The caterpillar is greenish or pinkish ochreous, mottled with darker, and with slightly paler lines on the back and sides ; head light brown. It will feed in July and August on knot-grass ; and soapwort (*Saponaria*), *Silene inflata*, and *Dianthus*, have been mentioned as food plants. The moth is out in June and July. The species occurs in nearly all the counties of England to Yorkshire, but except in Cambridgeshire, and perhaps Oxfordshire, it is not common in any of the southern or eastern counties, although more frequently found in them than northwards. It has not been recorded from Scotland, and seems to be rare in Ireland, as it has only been noted from Co. Cork.

Feathered Gothic (*Tholera popularis*).

The male of this species (Plate 127, Fig. 3) is strongly attracted by light, and frequently seen in houses, and is no doubt a familiar object to most residents in the country, and even in the suburbs of London. The female (Fig. 4) does not visit light, but this sex, and the males also, may be found sitting after dark upon the upper erect leaves of the hard grasses, such as the matweed (*Nardus stricta*). Of course a lantern will be required to throw a light on the business of collecting them, and it is curious to note that even the brilliant glare of the acetylene lamp does not seem to disturb the moths very much, if at all.

The caterpillar is dark greenish brown and rather glossy, with a dusky plate on the first ring upon which are traces of the five dark-edged pale brownish stripes which traverse the body and meet on the last ring ; the latter has a black plate. The spiracles are black, and the head is brownish, marked with

darker. The caterpillars hatch in the spring from eggs laid the previous autumn, and may be found until July. They feed at night on the leaves of grasses, especially *Nardus* and such kinds, growing in parks and open places. The moth is out in August and September, and occurs more or less commonly throughout England and Wales. In Scotland it is found in Ayrshire, and in other localities in the Clyde area; thence eastward to Aberdeen. Kane states that in Ireland it is generally distributed, and in some localities very abundant, as at Clonbrock, and on the Wicklow coast.

The Hedge Rustic (*Tholera cespitis*).

The sexes of this moth are depicted on Plate 128, Figs. 8 ♂, 9 ♀. In habits, and also in the kind of places it frequents, this species has much in common with that last mentioned. It is certainly more local, but its range in the British Isles is somewhat similar to that of the Gothic. The life history also is very like that of the last species, and the caterpillar feeds on the same kinds of grass.

Antler Moth (*Cerapteryx graminis*).

This moth (Plate 127, Figs. 8 ♂, 9 ♀) has the fore wings greyish brown or reddish brown, sometimes tinged with ochreous in the paler forms, or with olive in the darker forms. There is also variation in the markings, and chiefly of the central forked streak which has been likened to the antler of the stag. In most British specimens of the greyish form this is white throughout its length, and it has three branches; the stigmata are whitish, and there is often a whitish bar below the central streak. A number of aberrations have been named, and of these the following seem to be the most important: var. *tricuspis*, Esp., reddish brown; branched streak, stigmata, and bar ochreous; var. *rufa*, Tutt. = *tricuspis*, Hübn., as above, but

Pl. 128. *R* 256.

1. **Feathered Ear Moth.** 2, 3. **Straw Underwing.** 4. **Silver Cloud.**
5, 6. **Flounced Rustic.** 7. **Haworth's Minor.** 8, 9. **Hedge Rustic.**

Pl. 129. *S* 257.

1, 1*a*. **Bright-line Brown Eye:** *caterpillar and chrysalis.*
2. **Dot Moth:** *caterpillar.* 3, 3*a*. **Broom Moth:** *caterpillars and chrysalis.*
4. **Brindled Green Moth:** *egg, natural size and enlarged.*

the markings white ; var. *ruficosta*, Tutt = *graminis*, Hübn., greyish brown, with reddish front margin, and ochreous markings ; var. *hibernicus*, Curt., yellowish brown with the markings ochreous, and the stigmata more or less united with the central streak. In some specimens most of the markings are obscured or absent, and only the reniform stigma and the forked extremity of the central line remain distinct.

The caterpillar, which is glossy, and the skin much wrinkled, is of a bronzy-brown colour, with black-edged pale lines ; there is a brownish plate on the first ring and a blackish one on the last ; the spiracles are black and the head is brownish, marked with darker. It feeds from March to June on grasses, and in some years and localities occurs in enormous numbers, denuding considerable areas of grass land. Rooks and other birds devour them readily, and where their feeding places are on hillsides, they are apt to be washed off by heavy rain, so that the drains and ditches become filled up in places by masses of these caterpillars. Even after such wholesale destruction, the moths may still appear in the autumn in countless numbers. The male moths are sometimes seen flying in the sunshine and visiting the flowers of thistles, ragwort, etc. Such flight usually takes place between eight a.m. and noon, but both sexes have been seen flying over grass and heather continuously from just before midday to four p.m. The moths are also on the wing at night, and the male is very susceptible to the attraction of light. The species has occurred in all parts of the British Islands, but its presence in the south of England would appear to be more casual than elsewhere. The range abroad extends through Northern Asia to Siberia.

The Feathered Ear (*Pachetra leucophæa*).

Stephens, in 1829, figured one of two specimens of this species said to have been taken near Bristol in 1816, a part of England

from which no other specimen has ever been recorded so far as I am aware. In June, 1855, the late Mr. S. Stevens obtained a few specimens at sugar, at Mickleham, Surrey. Between the year last mentioned and 1894 five other specimens have been recorded from the same county, these are Redhill (W. R. Jeffrey), Boxhill (G. Elisha, a pair, and B. A. Bower), Reigate (R. Adkin). In Kent, specimens have been found in the Folkestone and Tunbridge districts, but the chalk downs between Ashford and Wye appear to be the headquarters of the insect in Britain.

A portrait of a male specimen will be found on Plate 128, Fig. 1, but the ground colour is much whiter in the majority of British specimens.

According to Dr. Chapman, the caterpillar varies from a nearly uniform nankeen-yellow with the markings only indicated, to a handsome larva with distinct black stripes. There is a pale dorsal line, quite narrow ; thence to the black spiracles is divided into three longitudinal stripes, a dark dorsal, a dark (but less dark) lower one and a pale intermediate. In all these the ground colour is the same, nankeen-yellow, and the darker areas depend on the greater or less darkness of fine black mottlings, generally in fine wavy streaks running more or less longitudinally. The head is rather brown than yellow, mottled in a honey-comb pattern, with some black marking about the mouth parts. It feeds at night from July to March on various grasses, but seems to prefer *Poa annua*, and *P. nemoralis*. Dr. Chapman reared some of these caterpillars by keeping each individual in a separate glass jar and supplying it at frequent intervals with a fresh tuft of *Poa annua*. The moth is out from May to July, and hides during the day among the tufts of grass on chalk hills. It comes freely to sugar, and has been taken at privet blossom.

The Silver Cloud (*Xylomyges conspicillaris*).

Three forms of this species occur with us. In that represented on Plate 128, Fig. 4, the fore wings are almost entirely

blackish. Another has a larger portion of the inner marginal area ochreous brown, or whitish, ab. *melaleuca*, Vieweg; a third form, and the least frequent, may be described as pale ochreous brown with darker mottling on the basal half, and black central markings representing a broken streak from the base of the wing to the outer margin, in this form the pale outlined stigmata are fairly distinct; and there is a blackish shade between them extending from the front to the inner margin. From chrysalids obtained by digging under oak and elm trees in a private park several miles from Taunton, Somerset, Mr. H. Doidge (1901) reared moths and obtained eggs which were laid in a batch on the covering of the cage in which the female was placed with a growing plant of bird's-foot trefoil. The eggs hatched on May 31, ten days after they were laid. The young caterpillars were purplish grey, but after feeding on the yellow flowers they assumed the same colour. "After finishing the flowers they commenced on the leaves, by which time they were a pale green colour, with a yellow spiracular stripe, and were fond of resting by day on the stems of the plant. As they approached the final stage, the green became shaded with brown and black," and then resembled the ripening seed pods. They were afterwards supplied with blackthorn, and did not object to the change of food. They also ate dock (sparingly), and *Trifolium minus*. "About July 8 they began to go under ground to pupate. The pupæ, which were of a dark reddish-brown colour, and somewhat obese and blunt, being enclosed in a very compact and brittle earthy cocoon" (Doidge). See Appendix.

The moth is out in April and May, but is very local in England. It has occasionally been found at rest on isolated tree trunks or on posts, but very rarely captured in any other way. Specimens have been obtained from chrysalids dug up now and then from about the roots of trees, but perhaps most of the specimens in collections, not numerous altogether, have been reared from eggs. In England the species is only known

to occur in Kent, Surrey, Suffolk, Gloucester, Somersetshire, Worcestershire, and Herefordshire. Barrett also mentions one specimen at Gower, South Wales.

The Beautiful Arches (*Eumichtis satura*).

Of this species (Plate 121, Fig. 5) probably less than a dozen specimens have been taken in England, and apparently none in any other part of the British Isles. It is very similar to some of the darker forms of *E. adusta*, specimens of which have often been mistaken for examples of the present species and recorded as such. The wings are rather more ample ; the reniform and orbicular stigmata are reddish, with a blackish cloud under them, and the space between the second and submarginal lines towards the inner margin is also reddish. The hind wings are dark in both sexes. The caterpillar, which is said to feed in July and August on hop, honey-suckle, and cherry, among other plants, is pinkish brown, darker above ; the dusky-pink central line on the back is interrupted and indistinct, and on each side of it is a series of oblique greyish but not clearly defined streaks ; the line low down on the sides is yellow-green. The moths flies in June, July, and August.

Abroad the species occurs in Central and Northern Europe (except the most northern parts, and perhaps Western France) ; eastward the range extends to Amurland.

The Dark Brocade (*Eumichtis adusta*).

The sexes of this moth are figured on Plate 121, Figs. 3 ♂, 4 ♀. The ground colour is grey-brown in some examples of this species, whilst in others, especially in the north of England and in Scotland, the colour ranges through rich reddish brown, blackish brown to almost black. In the lighter coloured forms the markings are usually clear and distinct, but in the darker

Pl. 130. *S* 260.

1. Slender Brindle: *caterpillar.* 2, 2*a*. Clouded Brindle: *caterpillar and chrysalis.*
3. Lychnis: *caterpillar.* 4. Clouded Bordered Brindle: *caterpillar.*

Pl. 131. *S* 261.

1, 2. **Large Nutmeg Moth.**
5, 6. **Crescent Striped Moth.**
3, 4. **Confused Moth.**
7, 8. **Dusky Brocade Moth.**

forms are often much obscured. The caterpillar is somewhat variable in colour and markings. Barrett describes one form as pale sage green strongly tinged with ochreous and dusted with greyish brown ; the line along the middle of the back is white, interrupted, and edged with greyish brown ; a series of outlines of greyish-brown diamonds spread over to the brown margin of the pale ochreous stripe along the whitish spiracles, and form a network on the back and sides. Another form, described by Buckler, has the general colour brilliant yellow, suffused on the upper surface with deep rose pink ; a stripe on the middle of the back composed of two darker pink lines, united and forming a spot at the beginning of each segment, and an interrupted yellow stripe on each side. It feeds from July to September on grass and various low plants, including knot-grass, bladder campion (*Silene cucubalus*) ; also sweet gale, sallow, etc. The moth flies in June and July, sometimes in May. The species occurs in woods and on heaths and moors, and is generally distributed, and more or less common throughout the British Isles. The range abroad extends to Amurland.

The Brindled Green (*Eumichtis protea*).

Green of some shade is often the prevailing colour in the much ornamented moth portrayed on Plate 122, Figs. 11, 12 ; but in some specimens the general colour is pinkish white. The variegation consists of reddish brown or pinkish, and white clouds and black streaks, chiefly as edging to the pale cross lines, or between the stigmata ; these latter are as often obscure as distinct, but sometimes the orbicular is white with a white mark below it extending to the black bar connecting the first and second cross lines.

The caterpillar is green freckled with yellow, with a yellow central line on the back ; head brownish. It feeds from March to June, and when it leaves the egg it bores into an oak bud to

feed ; later on it spins the young leaves together, and finally it dispenses with a retreat altogether and feeds openly on the leaves. The moth is out in the autumn, rather earlier in Scotland. It is widely distributed in England, and in some seasons and localities very abundant. In Scotland it is found from Roxburgh to Moray, and in the latter county as well as in Perthshire and Argyll it is often plentiful. Rather local in Ireland, but is recorded from Tyrone, Galway, Down, and Westmeath.

The Northern Arches (*Apamea exulis*)

The specimens of this species shown on Plate 123, Figs. 1, 4, are from Shetland, and more or less of the typical form, but rather more variegated, perhaps, than the actual type. In other specimens from the same locality the yellowish submarginal line is band-like ; or the ground colour is browner, and sometimes blackish. These blackish examples approach var. *assimilis*, Doubleday (Fig. 3), from Perthshire, where it was first met with, at Rannoch, by Weaver, over sixty years ago. *Exulis* (The Exile) was discovered by Mr. H. McArthur in the Shetlands in 1883. In 1896 Mr. P. M. Bright captured a specimen in the Shetlands which Barrett considered referable to *maillardi*, Hübn. (Geyer, Fig. 833.) "Its ground colour is drab-brown, abundantly marked with umberous and dusted with black, and its only conspicuous marking is the reniform stigma, which is distinctly edged with white in such a manner as to give it a singular resemblance to *Mamestra brassicæ*." The caterpillar is ochreous whitish, shaded with grey, and with yellowish plates on the first and last rings ; spiracles black, head reddish brown. It feeds on grasses from August to May, but is sometimes two, or even three, years in completing its growth. When young, and also later, it eats the lower part of the stem and

partly into the root of the grass. The moth is out in July and August. Very few examples of the *assimilis* form have been obtained, and these only in Perthshire, Aberdeenshire, Inverness, and the Isle of Arran. Mr. W. M. Christy captured one specimen in Ross-shire in August, 1902. The geographical range of this species extends to Iceland, Greenland, and Labrador.

The Minor Shoulder-Knot (*Bombycia viminalis*).

Figs. 5 and 6 on Plate 125 represent the typical form of this species. Fig. 8 shows the blackish var. *obscura*, Staud., and Fig. 7 an intermediate form. The pale form is most frequent in southern England, and dark forms are commoner in the north. Both forms occur in Scotland, but in some parts the pale form only is found. The caterpillar is green with three whitish lines on the back ; the raised spots are also whitish ; the line along the black spiracles is yellowish. It feeds from April to June on sallow and willow ; at first on the terminal shoots, the leaves of which are spun together with silk. Later on the caterpillar folds down or rolls a leaf so as to form a shelter. The moth is on the wing in June and July, sometimes later, and is pretty widely distributed throughout the British Isles, but is rather local in Scotland, northern England, and Ireland. The dark form, it may be mentioned, does not seem to be found abroad. The range of the species extends to Amurland.

The Dusky Sallow (*Eremobia ochroleuca*).

This brownish tinged ochreous moth (Plate 126, Figs. 3, 4) has the fore wings crossed by whitish lines, the first and second of which approach or unite below the middle, dividing into two blotches the dark central band-like shade.

The caterpillar, which feeds on the seeds of cock's-foot (*Dactylis*) and other kinds of grass from May to early July, is whitish green and glossy; three whitish stripes on the back, the central one broadest; a stripe below the black spiracles is whitish, edged above with green. Mullein (*Verbascum*) has also been mentioned as eaten by this caterpillar. The moth is out in July and in August, and may often be seen resting on the flowers of knapweed (*Centaurea*) in the daytime. It flies at night, and has been taken at the flowers of centaurea, ragwort, etc., and at light. In some districts it is said to visit the sugar patch, but not to do so in other localities. Occurs in the chalk districts of most southern English counties, and especially those of Kent and Sussex; also, but only rarely, in Warwickshire and Yorkshire. One specimen has been recorded from Pembrokeshire in Wales.

The Orache Moth (*Trachea atriplicis*).

In the past this greenish-mottled brownish moth (Plate 126, Fig 5) appears to have been commoner, and more widely distributed in England than it now is. Wilkes, in 1773, referring to it as "The Wild Arrach," states that it was taken occasionally near London. At the present time the species seems to occur only in the eastern counties, and chiefly in Cambridgeshire. In June, 1904 and 1905, specimens (three in all) were obtained at sugar in Huntingdonshire. The caterpillar is ochreous or reddish brown, dotted with white; three dark lines on the back, the central one only distinct. A yellowish stripe along the black-edged white spiracles; head light reddish brown, glossy. It feeds in July and August on orach (*Atriplex*), persicaria, knot-grass, and will also eat dock. The range abroad extends to Amurland, Corea, and Japan.

NOTE.—It may be mentioned here that *Prodenia litura*, Fabr., an inhabitant of tropical and sub-tropical regions, has

been occasionally reared in this country from caterpillars found in imported tomatoes.

The Saxon (*Hyppa rectilinea*).

The brownish clouding, and reddish-brown central band, of this species (Plate 126, Figs. 6, 7) varies in tone; sometimes the band is olive grey and the clouding rather grey than brown. The caterpillar, according to Buckler, varies from dark brown to chestnut, ochreous, and orange browns; the spiracular stripe pale ochreous or cream colour, shading off in the middle to grey brown. It feeds from July to September, or later, on sallow, bramble, bearberry (*Arctostaphylos uva-ursi*), and will eat knot-grass. It hibernates when full grown, and pupates in the following spring. The moth is out in May, June, or July, and is taken at sugar, chiefly in woods. At one time it was found in Yorkshire, but Cumberland seems to be the only English county in which it now occurs. In Scotland it has been taken in the south. Renton states that near Hawick, Roxburghshire, he finds a few at raspberry blossom every year. It is more plentiful, however, from Perthshire to Sutherland. Kane notes it from Torc Wood, Killarney, near Galway, and Clonbrock; and that the form is identical with that from Aberdeen named *semivirgata*, Tutt. The range abroad extends to Siberia and Amurland; and the North American, *xylinoides*, Guen, seems to be a form of the present species.

The Figure of Eight Moth (*Episema cæruleocephala*).

The greyish-centred white marks are the chief features on the brownish fore wings of this moth (Plate 127, Figs. 1, 2). The first one, or both when quite apart, is very like the figure 8; sometimes these marks are united, and form an irregular blotch. Rarely the area between the black lines is dark and the marks

obscured or absent. The caterpillar (Plate 133, Fig. 1) is bluish grey, with a number of bristle-bearing black spots and minute black dots ; a stripe along the back is yellow and interrupted ; a yellow stripe low down along the sides. It feeds, from April to June, on hawthorn, sloe, and wild crab ; also on the leaves of apple, plum, and other fruit trees. Sometimes these caterpillars are to be seen on the hedges in numbers, and usually seem to prefer the outer extremities of the longer shoots. The pale purplish brown chrysalis is enclosed in a strong somewhat oval cocoon, which is covered with fragments of litter, and often attached to some object, such as a bit of stick, leaves, etc., on the ground. The moth is out in October and November, but is rarely seen, except occasionally at gas lamps, etc. Generally common in the south and east of England, and widely distributed throughout the rest of the country to Cumberland. It has occurred in a few Clydesdale localities, and has been recorded by Renton as sometimes common in Roxburghshire. Widely distributed in Ireland, but not often plentiful.

The Green Brindled Dot (*Synvaleria oleagina*).

Nearly eighty years ago Stephens summed up all that was known of this species in Britain. As there is nothing to add in the way of later records, his remarks may be quoted. "Very rare ; specimens have been found in Richmond Park, and one was taken in the pupa state by Mr. Plastead some twenty or thirty years ago in Battersea Fields ; others have occurred near Bristol, and Mr. Donovan, I believe, captured one in South Wales ; it has also been taken in Scotland. My specimens were from the former locality, and I have been fortunate enough to have had nearly a dozen examples at various periods." Most of the later authors mention only the Welsh specimen, taken at Fishguard in Pembrokeshire, July, 1800. A continental specimen is shown on Plate 127, Fig. 5.

The Beautiful Gothic (*Leucochlæna hispida*).

This species (Plate 127, Figs. 6, 7) varies in the brown colour of the fore wings, which is sometimes of a greyish tint; not infrequently the pale cross lines are tinged with brownish, or they may be rather broad, and, the submarginal especially, white and very distinct; the reniform and orbicular marks are sometimes tinged with pink. The caterpillar (Plate 133, Fig. 3) is pale rusty brown, with blackish markings, and three pale lines on the back; head glossy and rather paler than the body, and marked with two blackish lines. It feeds on grasses from September to March. The specimen figured (slightly enlarged) was received from Mr. Walker of Torquay on January 11, 1907. The chrysalis (Fig. 3A) is dull reddish, ring divisions and wing-cases paler and brighter; two hooks on last ring. The moth is out from the latter part of August to early October, and in its haunts, which are cliffs by the sea, it may be found at night sitting on grass stems. It is not known to visit flowers or the sugar patch, but has been taken at light. Although previously taken in the Isle of Portland, the earliest published record was that in the *Zoologist* for 1849 of a specimen taken on the sand-hills at Exmouth, late in September. It still occurs at Portland and at Swanage in Dorset; also in the Isle of Wight and along the Devon coast to Cornwall. The range abroad is restricted, the species only being noted from Southern France, North-east and Southern Spain, Sicily, Palestine, and North-west Africa.

The Flounced Rustic (*Luperina testacea*).

Portraits of this moth will be found on Plate 128, Figs. 5, 6. The ground colour of the fore wings ranges from very pale brown through greyish brown to blackish. In some specimens the markings are very faint, and, excepting the whitish sub-marginal line, are hardly visible. Usually there is a black or

dark brown bar connecting the first and second cross lines; not infrequently there is a black mark on the inner margin below the bar, and a black mark or two in the cell above. These marks are sometimes supplemented by others, and so form a more or less complete black central band. The reniform and orbicular stigmata are often only outlined in paler brown, but they may be whitish and very distinct. *L. guenéei*, Doubleday, is pale ochreous brown, with the first line pale, interrupted, and terminating in a black dot on inner margin; and the second line made up of white-edged black crescents; the reniform distinctly edged with white, and there is a slender black line above the inner margin between the first line and the base of the wing. Hind wings pure white, with black marginal lunules. (See Appendix.)

The caterpillar is pinkish ochreous; usual dots not in evidence; skin much wrinkled and glossy; spiracles pink margined with black; head and plate on first ring pale brownish yellow. Robson (Cat. Lep. of Durham, etc.) states that the caterpillar feeds on grass roots, and adds, "I have known it abound in the grass tufts at the foot of palings around a large mill." The moth is out in August and September. At night it flies freely to light, but is not known to visit any of the usual floral attractions or the collector's sugar. Generally distributed and often common throughout the British Isles.

Dumeril's Luperina (*Luperina dumerilii*).

Fore wings ochreous grey or brown, two brownish streaks represent the basal line; the space between the first and second cross lines darker, and there is a darker band on the outer margin; the stigmata are pale inclining to yellowish, and the veins below them are white. Hind wings whitish tinged with darker on outer margin. Ab. *desyllesi*, Boisd., has almost unicolorous fore wings, and this form, according to Staudinger,

Pl. 132. *S.* 268.

1, 2. **Rustic Shoulder-knot.** 3, 4. **Small Clouded Brindle.** 5. **Double-lobed Moth.**
6–11. **Common Rustic.** 12. **Union Rustic.** 13. **Flame Moth.**

Pl. 133. *S* 269.

1. **Figure of Eight:** *caterpillar.*
2. **Feathered Ranunculus:** *caterpillar.*
3, 3*a*. **Beautiful Gothic:** *caterpillar and chrysalis.*

has been found in Northern France and England. I have only seen a continental specimen of this species, which is very local and somewhat rare abroad.

In his *Manual*, vol. i. (1857), Stainton states, "one specimen has occurred in the Isle of Arran." Reference is made in 1885 (*Entom.* xviii. 73) to two specimens taken in the Isle of Portland in 1858, and three others in 1859. Then, in the *Entomologist* for 1902, Mr. Stockwell records, from Dover, the capture of "a fine female of this rare Noctua, on a gas lamp in this town, during the latter part of September." Again in Sussex in 1936.

The Straw Underwing (*Thalpophila matura.*)

This moth, both sexes of which are shown on Plate 128, Figs. 2, 3, is readily recognized by the yellowish hind wings. The caterpillar is ochreous or dull reddish brown; series of greyish brown marks along the middle of the back, and a brown edged line on each side; a pale ochreous line edged above with brown low down along the sides; head pale brown, with darker streaks. It feeds from September to April, sometimes later, on grasses, chiefly in dry situations. The moth is out in July and August. Generally distributed throughout the British Isles, but in Scotland not recorded north of Moray. In suitable localities it is common, and sometimes is the only visitor to the sugar patch.

Haworth's Minor (*Celæna haworthii*).

In this reddish brown moth (Plate 128, Fig. 7) the reniform and orbicular stigmata are white or broadly outlined in white, and the vein below as well as the branches also white. The wings of the female are smaller than those of the male, and the body is distinctly stouter. The white markings referred to are sometimes obscured or absent, and such specimens are referable

to var. *hibernica*, Haworth. The caterpillar is purplish brown, with the usual raised dots darker brown; three pale lines along the back, the central one least distinct; head and plates on first and last rings reddish brown; spiracles black. From April to July on cotton grass (*Eriophorum vaginatum*), feeding in the stems down towards the root. The moth flies in August and September. It was first noted as British in 1819, and Stephens in 1829 mentions it as common in Whittlesea Mere. Although still occurring in the fens, the species is far more common on the moors and mosses of Northern England, Scotland to the Shetlands, Ireland, and in Norfolk and Dorset.

The Crescent Striped (*Apamea oblonga*).

In its most frequent form this species (Plate 131, Figs. 5, 6) has the fore wings greyish brown and somewhat shining; the markings, especially the cross lines, indistinctly paler; the reniform is outwardly dotted with white. Sometimes the ground colour is paler grey with black markings arranged very similar to such marks in *A. obscura*, var. *remissa* (Fig. 8).

The caterpillar is greenish grey, with the raised dots rather greyer; a pinkish line along the back; head and plate on first and last rings shining reddish brown. It feeds on grasses growing in salt marshes, edges of tidal rivers, and ditches of brackish water: in the spring and until June; perhaps from September. The moth is out from June to August, and may be obtained at the flowers of marram grass as well as at sugar. The species is found in most of the eastern and southern seaboard counties of England; at Sandown and Freshwater in the Isle of Wight; in the fens of Huntingdon and Cambridge; also occasionally in Herefordshire, Gloucestershire, Lancs, Yorks, and Durham. In Scotland it has been obtained in Moray and in the Shetlands. Local in Ireland The range abroad extends to Amurland.

The Large Nutmeg (*Apamea anceps*).

The fore wings of this moth (Plate 131, Figs. 1, 2) are pale ochreous brown, much marbled with darker brown, and sometimes slightly tinged with reddish ; the pale stigmata and submarginal line are the most distinct of the usual markings. The caterpillar is said to be very like that of *Apamea basilinea*. The moth flies in June, and is not uncommon in most parts of Southern England. It occurs in Lancashire and Cheshire, but is more frequent in Yorkshire and Durham ; also found in South Wales, and although it has been obtained in the Shetlands, it seems to be very local and infrequent in Scotland. Only twice recorded from Ireland, one specimen on the Dublin coast, 1860, and one at Howth (Kane).

The Confused (*Apamea furva*).

This darker mottled greyish brown moth (Plate 131, Figs. 3, 4) is very similar to the typical form of *A. obscura* (Fig. 7) ; the fore wings, however, are distinctly broader at the base, the W-like angles of the submarginal line are less noticeable, and this line is comparatively straighter. The reddish tinge so usual in *A. obscura* is absent in the present species.

The caterpillar is ochreous tinged with pinkish, except on the first three rings and the under surface ; central line dusky ; usual dots reddish brown, as also are the head and plates on first and last rings. On grasses, September to June, feeding chiefly on the shoots near the roots (condensed from Buckler). The moth occurs from July to September, and may be obtained at flowers of ragwort, scabious, etc., and freely at sugar, in rocky places from Lancashire northwards through Scotland to the Shetlands. It also occurs in Wales, and suitable places in Gloucester, Somerset, Devon, Cornwall, and has also been recorded from Sussex. In Ireland found on several parts of

the coast, but not plentiful. Abroad the range extends to Amurland.

The Dusky Brocade (*Apamea obscura*).

In its ordinary form the moth shown on Plate 131 is purplish brown, as in Fig. 7, sometimes mottled with greyish or pale ochreous. A more ornamented form is known as var. *remissa* (Fig. 8), and the ground colour of this is not infrequently pale ochreous brown, or almost whitish, with the black marking very conspicuous. The caterpillar is brownish grey, finely striated with darker; a yellowish white line along the middle of the back, and a brownish ochreous stripe on each side of it; stripe along the black edged spiracles greyish ochreous. It feeds from autumn till March on grasses in moist situations. The moth is perhaps most abundant in the south, but it occurs, in June and July, pretty well all over the British Isles; and abroad its range extends to Amurland and Japan.

The Rustic Shoulder Knot (*Apamea basilinea*).

The species shown on Plate 132, Figs. 1 ♂, 2 ♀, is found almost everywhere in the British Isles, is generally common, and in many parts abundant. Usually the pale brown fore wings are clouded or suffused with reddish, but this tint may be absent, or the wings may be tinged with greyish: the single black dash from middle of the base is the "Shoulder Knot." The caterpillar, according to Barrett, is pale olive brown varying to grey brown; a greyish white line along the middle of the back edged with short undulating black lines; spiracular line a row of blackish dashes, clouded with olive brown, or edged with greyish white and looped with grey brown; head black, plate on first ring black and white striped. It feeds from August to March on grasses, etc. The moth flies in May and June.

The Small Clouded Brindle (*Apamea unanimis*).

The fore wings are generally reddish brown mottled with darker, but the reddish tinge may be almost absent; the reniform is more or less outlined in white and there are two black streaks from the base. (Plate 132, Figs. 3 ♂, 4 ♀.) The caterpillar is pale ochreous brown, sometimes tinged with greenish; three dark edged pale lines on the back; spiracular line pale edged above with darker; head, and plate on first ring, brown and glossy. On grasses that occur in damp places, such as water meads, marshes and fens from July to April. The moth flies in June and July. It is widely distributed, and sometimes common in most moist localities throughout England. More local in Scotland but occurring in Aberdeenshire, and on the western side ranging to the Orkneys. Not frequent in Ireland, but has been obtained in several parts. The distribution abroad extends to Amurland.

The Union Rustic (*Apamea pabulatricula*).

The very distinctly marked, and sometimes brownish tinged, greyish white moth shown on Plate 132, Fig. 12, is very local in the British Isles, and apart from its reported occurrence in the Clyde and Tay districts of Scotland, seems to be found only in some of the woods of South Yorkshire, as near Rotherham, Sheffield (Wharncliffe Woods), and Barnsley. It has been obtained in Cumberland; and Barrett states that formerly it occurred in Norfolk. The caterpillar, which is little known, is said to feed on grasses in May. The moth flies in August and early September.

The Common Rustic (*Apamea secalis*).

Following Guenée, British entomologists at one time knew this species as *oculea;* afterwards it became the habit to label it *didyma*, a name given to it by Esper in 1788. Just now the authorities insist on *secalis*, Linnæus, being adopted. The species is an exceedingly variable one, and six examples of it are shown on Plate 132, Figs. 6 to 11. The form with blackish fore wings and a white reniform mark is var. *leucostigma*, Esp. *Nictitans*, Esp., has brownish fore wings and a white reniform. *I-niger*, Haw., is greyish or grey brown with darker central band, and the cross lines united by a black bar. Ochreous or reddish ochreous specimens with the front marginal area broadly and irregularly reddish brown, and the outer margin bordered with reddish brown, are referable to var. *furca*, Haw. Many other forms have been named. The caterpillar is green with three reddish lines on the back; head and plate on the first ring pale brown, also plate on last ring. In stems of grasses such as *Festuca*, *Dactylis*, etc., also on wood-rush. From Autumn to April or May. The moth flies in July and August, and is common everywhere in the British Isles; its range abroad extends to Western China.

The Double Lobed (*Apamea ophiogramma*).

This species (Plate 132, Fig. 5) is usually found in marshy localities, or in gardens, over the eastern counties, and from Northamptonshire through Bucks, and Hertfordshire, to Kent, and Surrey. The caterpillar feeds from September on the shoots of *Phalaris arundinacea* and the cultivated form of that plant grown in gardens, and known as ribbon grass. Also said to feed on *Poa aquatica*. When the grass dies down in the late autumn the caterpillar enters the ground to hibernate, and

emerges in the spring ready to attack the young grass shoots as soon as they appear. Where the new growth of ribbon grass assumes a brown and withered appearance this larva will probably be found at the bottom of the trouble. When nearly full grown it eats down the interior of the thicker stems to the base. In colour it is ochreous with a pinkish tinge; a pale brownish plate on first and last rings, each edged with blackish and that on the first ring traversed by a white line; head pale brown, glossy. The moth flies in July and August, sometimes in June.

The Marbled Minor (*Procus strigilis*).

Half a dozen specimens are shown on Plate 134, and these will serve to give some idea of the range of aberration in this species. The most typical of the species are those represented by Figs. 1 and 4; the farthest removed from the type is var. *æthiops*, Haworth (Fig. 16). In the other species *latruncula*, Schiff., as figured by Hübner, the most conspicuous character is the white lower curve of the second cross line, as in Fig. 7.

The caterpillar is purplish brown above, and ochreous below; striped on the back with pale yellow, and less distinctly on the sides; spiracles black and very distinct; head and plates on the first and last rings of the body ochreous brown and shining. Found in March and April, after hibernation, feeding on the stems of various grasses. The moth is out in June and July, and may frequently be seen at rest on palings, etc., but at night it often abounds at sugar or honey dew. Generally distributed in the British Isles, except perhaps in the islands of Scotland. (See Appendix.)

The Middle-barred Minor (*Procus fasciuncula*).

In its typical form this species (Plate 134, Fig. 2) has the fore wings reddish ochreous, with a darker central band, and

the cross lines, especially the second, distinctly white towards the inner margin. Sometimes, chiefly in Scotland, the ground colour is much paler, occasionally almost whitish, and the band reddish (var. *cana*, Staud., Figs. 5, 8). There is a good deal of variation, both in the ground colour and in that of the band; the latter is often smoky brown in pale specimens of both sexes.

The caterpillar is of a pale flesh tint, rather inclining to greyish ochreous, the dorsal stripe of a darker tint of the same colour well defined on each side by the pale ground colour; next a very broad stripe of pinkish brown, followed by a narrow stripe of the ground colour, faintly edged below with pinkish brown; above the black spiracles is a stripe of pinkish brown freckles; head and plates on first and last rings of the body light brown, shining (Buckler). In the shoots of grasses such as *Aira cæspitosa*, in April and early May, probably after hibernation. The moth is out in May and June, and its haunts are moist woods and marshy grounds, generally. The species is widely distributed, and often common, throughout the British Isles. Abroad it seems to have a very limited range.

The Rosy Minor (*Procus literosa*).

The ground colour is pale, or dark, violet grey, more or less clouded inwards from the submarginal line, and on the basal area, with purplish; a central reddish or reddish brown band is limited inwardly by the, sometimes, whitish edged black first line, and outwardly by an almost straight black line passing between the stigmata to the inner margin. (Plate 134, Figs. 11, 14.)

The caterpillar is dingy ochreous yellow, with a dark purplish stripe, enclosing a central line of the ground colour, on the back; spiracles black; head dark brown, plates pale brown (Porritt). From September to June, in stems of *Carex glauca*,

Pl. 134. *T* 276

1, 4, 7, 10, 13, 16. **Marbled Minor Moth.**
11, 14. **Rosy Minor.**
17, 18. **Least Minor.**
2, 5, 8. **Middle-barred Minor.**
3, 6, 9, 12, 15. **Cloaked Minor.**
19-21. **Small Dotted Buff.**

Pl. 135. *T* 227.

1, 2. **Clouded-bordered Brindle.** 3. **Light Arches.**
4, 5. **Clouded Brindle.** 6. **Reddish Light Arches.**
7, 8. **Slender Brindle.**

Dactylis glomerata, and other grasses. The moth flies in July and August, and although rare inland is pretty generally distributed around the coasts of the British Isles ; apparently, from the Clyde area, confined to the east coast of Scotland, and not extending north of Moray.

The Cloaked Minor (*Procus furuncula*).

This is another variable species of the genus, and five specimens of it are shown on Plate 134. The typical form (Fig. 3) has the fore wings more or less brownish on the basal area, and whitish bordered with brownish on the outer area. Very frequently these wings are pale, or dark, brown marbled with darker brown, and with the stigmata and cross lines distinct, faint, or absent. Fig. 15 represents a form from Ireland, which is uniformly pale ochreous brown, sometimes reddish tinged. The caterpillar is yellowish ochreous, tinged with pink ; three dull reddish interrupted bands, each intersected by a line of the ground colour ; head reddish brown ; plates on first and last rings of the body pale reddish brown (Buckler). In stems of grasses, such as *Festuca* and *Aira*—April and May ; probably after hibernation. The moth flies in August and September, sometimes earlier. At dusk it is often common in rough fields and grassy places near the sea. Although found in some inland localities, it is more especially a coast species, and as such is widely distributed over the British Isles to the Orkneys.

The Least Minor (*Phothedes captiuncula*).

The pretty little moth shown on Plate 134, Figs. 17, 18, has the fore wings brownish ochreous, tinged with reddish brown, and with a darker central band and hind margin. Sometimes the whole basal area up to the white second line

is reddish brown ; and in a form from Ireland named *tincta*, Kane, the coloration is somewhat similar to that of *M. literosa*. This species was first discovered in Britain by Messrs. Law and Sang, in a locality near Darlington, Durham, in 1854. It is now obtained in several places in that county, and in Northumberland. Also found in North Lancashire, Westmoreland, and once in Yorkshire. It occurs commonly in Co. Galway and Clare, Ireland. The Killarney record is doubtful. There is also a record from Perthshire in Scotland.

The caterpillar is dull ochreous, with a reddish tinge inclining to purplish on rings two to seven ; head reddish brown ; plates on first and last rings yellow brown, the former edged in front with darker brown ; spiracles black, three yellow spots on sides of rings two and three (Buckler). On *Carex glauca* and other sedges, eating down the stems close to the roots. Will also eat ribbon grass—August to June. The moth flies, often in the early afternoon, from late June to August. It seems partial to rough fields, and hillsides, chiefly on the coast.

The Clouded-bordered Brindle (*Apamea rurea*).

Of this common, generally distributed, and often abundant species, portraits of the typical form (Fig. 1), and of var. *alopecurus*, Esp. (Fig. 2), will be found on Plate 135. The ground colour varies from the normal greyish white to a silvery white (var. *argentea*, Tutt), and through yellowish shades to a reddish ochreous ; the markings in all these colour aberrations are more or less typical. In the var. *alopecurus*, Esp., there are also gradations ; thus *combusta*, Haworth, is dark greyish brown ; and a blackish brown, red tinged form is *nigro-rubida*, Tutt. The caterpillar (Plate 130, Fig. 4) is variable in colour, one form is ochreous grey with three lines on the back, the central one white shaded on each side with grey ; usual dots and spiracles are black ; head blackish and shining. From

August to May on grasses. The range abroad extends to Amurland.

The Light Arches (*Apamea lithoxylea*).

In this whitish ochreous species (Plate 135, Fig. 3) there is little variation except that the darker clouding is more pronounced in some specimens than in others. The caterpillar is brownish grey, tinged with ochreous or with greenish; usual dots blackish, as also are the head and the plates on first and last rings of the body. October to May, feeding on stems of grasses, near the roots. The moth is out in June and July, and is often seen on fences, etc., in the daytime. Generally distributed, and common in most places throughout the British Isles. In Scotland, however, it does not range north of Moray, and only on the eastern side.

The Reddish Light Arches (*Apamea sublustris*).

Except that the fore wings are somewhat reddish tinged, and not so long, this species (Plate 135, Fig. 6) is very similar to the last. The caterpillar is also very like that of the Light Arches, but has more red in its coloration. The moth is out in June and July, and affects limestone and chalk localities, and these chiefly on the coast. In Berkshire and adjoining counties it occurs in beech woods. Specimens have been recorded from Kendal in Westmoreland, but Yorkshire has been considered the northern limit of the species in England. It has been recorded occasionally from the fens. Paisley and Bonhill are given as Scottish localities in the *Fauna of the Clyde Area* (1901). Widely distributed in Ireland but most abundant in the province of Connaught.

Apamea zollikoferi. The home of this species would seem to be in parts of Hungary, Russia, and Western Asia, whence it very occasionally finds its way across the continent

to England. Its British history is as follows :—a specimen taken at Deal, by Mr. Harding, October, 1867 ; one at Inverurie in Scotland, by Mr. Tait, September, 1871 ; and one at sugar by Mr. T. A. Lofthouse at Linthorpe, Middlesbrough, September 26, 1903. Also recorded from Norwich, September, 1905, and from Methley, Yorks, August, 1910. (Plate 153, Fig. 6.) (See Appendix.)

The Dark Arches (*Apamea monoglypha*).

The five portraits of this moth on Plate 136 will give some idea of the various forms it assumes. The blackish specimen is referable to var. *infuscata*, White, and an extreme aberration of this form has been named *æthiops*, Tutt. The caterpillar is greyish, inclining to brownish or reddish ; usual dots blackish ; head and plate on first ring of body dark brownish, and shining. August to June, feeding on grasses and devouring the stems near the base. The moth is out from June to August, sometimes in October and November. It occurs in all parts of the British Isles and is often abundant.

The Clouded Brindle (*Apamea hepatica*).

The most frequent form of this species (Plate 135) has the fore wings pale brown, with well-defined black markings, but without distinct cross lines. When the wings are more clouded and suffused with reddish or purplish brown the paler ground colour shows up as cross lines, and these are more or less edged with blackish (var. *characterea*, Hübner). The caterpillar (Plate 130, Fig. 2) is dingy brown with shining black dots ; three pale ochreous lines along the back, the central one most distinct ; head black and shining ; plate on first ring of the body black crossed by white lines, another on the last ring is blackish. Feeds from August to April on grasses, but will also eat various low plants. The chrysalis (Fig. 2A) which

is enclosed in a tender earthen cocoon, is reddish, blackish between the rings, and the last ring, which is blunt at apex, is furnished with four hooks. The moth is out in June and July. A common species in the eastern and southern counties of England, but less frequent or rare in the Midlands and northwards to Roxburgh in Scotland. Local and not numerous in Ireland. Range abroad extends to Amurland.

The Slender Brindle (*Apamea scolopacina*).

This is another species with reddish brown clouded, pale ochreous brown fore wings. The ground colour may be whiter or redder than in the specimens shown on Plate 135, Figs. 7, 8. The caterpillar (Plate 130, Fig. 1) is dusky green above and whitish green beneath, the green shading into blackish along the sides; a fine whitish line along the middle of the back; usual dots black; head honey-brown and glossy, the jaws and a spot on each cheek black. It feeds on the juicy lower part of the stems of grasses, such as *Triticum*, but will also eat the leaves. In the spring, and till June, probably after hibernation. The moth is out in July and August, and as an uncommon event may be seen at rest on a tree trunk or paling. Stephens (1829) refers to its occurrence in the London district, and it still appears in woods around Highgate. It seems to be most plentiful in the woods of South Yorkshire, and in the Sherwood district of Nottinghamshire; but it has been found more or less frequently in several of the southern counties of England, and also in some northern ones. Its range abroad extends to Amurland and Japan.

The Bird's Wing (*Dypterygia scabriuscula*).

The curious wing-like marks on the blackish fore wings of this moth (Plate 137, Figs. 1 ♂, 2 ♀) are its chief features. The

stigmata are outlined in black, but are rarely paler than the ground colour. The caterpillar is reddish brown with yellow and black dots; three lines along the back, the central one white with a black edging, and the others blackish; head brown and glossy, marked with black; a blackish plate on first ring is also glossy, and is followed by a black mark on the next ring, both streaked with white. It feeds on dock, sorrel, and plants of the genus *Polygonum*, in July and August. The moth flies in late May and June, sometimes as a second generation in August or September. It occurs more or less commonly in most southern and eastern counties from Oxfordshire. In other parts of England, and in Scotland, it seems to be local or absent.

The Purple Cloud (*Cloantha polyodon*).

This moth is figured on Plate 137, Fig. 7. The first recorded British specimen was taken at Yarmouth, in June, 1839. In 1855 a specimen, found in a spider's web at Ashford, Hampshire, was exhibited at a meeting, held in May, of the Entomological Society of London. Two specimens were taken in 1892; one at Folkestone, Kent, at sugar, and the other outside Norwich, in Norfolk, at a gas lamp. In the *Entomologist* for 1894, there is a record of a specimen captured at sugar, July, 1891, at Clonbrock, Co. Galway, Ireland. The species has a wide range abroad, extending eastward to Amurland and Japan.

The Deep-brown Dart (*Aporophyla lutulenta*).

In the south of England the species (Plate 137, Figs. 9, 10) is generally of a dark brown coloration on the fore wings, and the markings are often indistinct; but blackish forms also occur, although the latter are more frequent northwards, and in Scotland and Ireland are the prevailing form of the species. In black or blackish specimens, usually referred to *luneburgensis*,

Freyer, the hind wings in the male, have the veins more or less blackish and dotted with black beyond the middle; var. *sedi*, Guenée, has the fore wings pale greyish with the markings distinct, and the central area blackish.

The caterpillar is green, sometimes tinged with pink on the first three rings; three brownish broken lines along the back, and a violet edged white line along the spiracles. It feeds on grasses, yarrow, groundsel, dock, plantain, gromwell (*Lithospermum*), and other low herbage; also on buds of hawthorn and sloe in the spring. October to April. The moth is out in August and September, sometimes later. It is found most frequently on the coast, perhaps, but occurs in Cambridgeshire, Hunts, Oxfordshire, Gloucestershire, Berks, Kent, Surrey, Sussex, Hants, and Isle of Wight; from Somerset to Cornwall; North and South Wales, Cheshire, Lancashire, and Yorkshire, and apparently in all counties northward except Westmoreland. Widely distributed in Scotland from the border to the Hebrides and Orkneys. It is found only on the coast in Ireland, and chiefly in the north-west.

The Black Rustic (*Aporophyla nigra*).

This black or brownish black moth (Plate 137, Fig. 8) has the outer edge of the reniform stigma ochreous, and the cross lines are sometimes dotted with the same colour. The caterpillar is green, yellowish-brown, or dull purplish; first three rings often tinged with reddish; three darker, often broken, lines along the back; line along the black-edged white spiracles yellowish. It feeds on bedstraw (*Galium mollugo*), dock, plantain, grasses, etc. October to May. (The egg is figured on Plate 139, Fig. 3.) The moth is out in September and October. Chiefly a northern species, but it occurs in some of the southern counties. It is, however, most frequent in Northampton, Huntingdon, and Cambridgeshire; in Gloucestershire,

and Wales, and in the Isle of Man, Cumberland, and Westmoreland. In Lincolnshire, Yorkshire, and Lancashire it seems to be local or rare. It is found up to Moray in Scotland, and is sometimes plentiful in Aberdeenshire, Inverness, and Moray. Very local in Ireland, but Kane says that it is found in the extreme north, south, east, and west.

The Feathered Brindle (*Aporophyla australis*).

The fore wings are pale grey, sometimes darker clouded, chiefly on the costa; the black cross lines, slender, wavy, but not always distinct; a short black bar from middle of the base and one below it on the inner margin; often two other bars, pretty much in a line with the basal ones, on the central area; a row of black wedges on the outer area, near margin. Hind wings white in the male, pale brownish grey in the female. Most of our specimens, perhaps all, are referable to var. *pascuea*, Curtis. The caterpillar is yellowish green tinged with reddish above; a pale reddish line along the middle of the back has black V-shaped marks upon it, and there is a series of black marks on each side; the line along the spiracles yellowish; head green, brown freckled. Feeds, from October to April, on grasses, campion (*Silene maritima*), etc. The moth, which is figured on Plate 137, Figs. 3, 4, is out from late August to October.

This is a local species in England and occurs on the south coast; in Kent, on the sand hills at Deal; in Sussex, on the downs at Brighton and Lewes; also on downs on the Isle of Wight. Farther west it is found at Portland in Dorset, and Torquay in Devon; thence along the Devon and Cornish coasts. In Ireland it is obtained, according to Kane, on the coast of Wicklow and Waterford, and is not scarce on the sand hills of Wexford Harbour.

Pl. 136.

Dark Arches Moth.

T 284.

Pl. 137. *T* 285.

1, 2. **Bird's Wing Moth.**
5, 6. **Feathered Ranunculus.**
8. **Black Rustic.**
3, 4. **Feathered Brindle.**
7. **Purple Cloud.**
9, 10. **Deep-brown Dart.**

The Feathered Ranunculus (*Eumichtis lichenea*).

This is a maritime species and is chiefly found in the Isle of Wight, the Isle of Portland, and along the coasts of Cornwall, Devon, Somerset, Gloucester, and on the opposite Welsh coast. It is locally common in Cheshire and Lancashire, and occurs on the coast of North Wales, in Flint and Carnarvon. In Yorkshire it is not uncommon at Scarborough. Has been recorded from the Lincolnshire coast and from Eastbourne. There are two records from Scotland—Renfrew and Ayr. In Ireland it is common at Howth, and abundant at Rossbeigh, Co. Kerry. This species, and the last two, have a rather limited range abroad. On Plate 137 are portraits of two local forms, Fig. 5 is from Portland, and Fig. 6 from Plymouth. It will be noted that the former is greyish in tone whilst the latter is greenish and rather larger. Similar local variation occurs throughout the range of the species.

The caterpillar (Plate 133, Fig. 2) is olive green inclining to brownish above; along the back are darker markings forming a central stripe and a paler interrupted stripe on each side; a pale stripe along the spiracles. It feeds from autumn to May on various low plants. The moth flies from late August to early October. The first British specimen is said to have been taken in the New Forest in 1847; but in 1850 about a hundred were captured at New Brighton in Cheshire.

The Brindled Ochre (*Dasypolia templi*).

The dull ochreous-brown moth shown on Plate 138, Fig. 1, has hardly any well-defined markings, but the cross lines are generally darker, and the reniform and orbicular paler. The caterpillar, which feeds in the roots of cow-parsnip (*Heracleum sphondylium*) from April to August, is pinkish ochreous with a rather darker stripe on the back; raised spots brown; head

reddish brown. The moth flies in the autumn, and, after hibernation, in the spring. It frequents rocky places on the coast and on hills. Its range in England is pretty much as in the last species, but it does not seem to occur on the south-east coast. In Scotland it is widely spread over the country to the Orkneys, and has been found in the most northern isle of the Shetlands, but it is generally uncommon. It has been taken near Dublin in Ireland, and less frequently in Antrim and Donegal.

The Large Ranunculus (*Antitype flavicincta*).

The fore wings of this moth (Plate 138, Figs. 6 and 7), are pale grey, clouded, and marked with darker; yellowish freckles at the base, and on the central area and the submarginal line are usually, but not always, present. Sometimes, chiefly in northern specimens, these wings are much suffused with darker grey, approaching blackish. The caterpillar is green with a yellowish or bluish tinge; a dusky line along the back, and a dark green line along the black-edged white spiracles. It feeds on dock, groundsel, plantain, and many other plants from April to July. The moth flies in September and October, and, except in Kent, and perhaps Sussex, is rather uncommon in the southern counties of England. It occurs, however, not infrequently in the eastern counties, and through Oxford, Berks, Gloucester, Somerset to Cornwall, and northward through Hereford and parts of the Midlands to Lancashire, Yorkshire, and Durham.

The Grey Chi (*Antitype chi*).

Four specimens are depicted on Plate, 138. Figs. 2 and 3 represent the sexes of the type form, and Figs. 4 and 5, the greenish-grey var. *olivacea*, Stephens. Both forms may be paler or darker, but the green tinge is apt to fade out. Var. *suffusa*, Tutt, is a dark greyish suffused form.

The caterpillar is green, inclining to bluish green above ; the lines on the back are whitish, edged with dark green ; that along the black-margined white spiracles is white, shaded above with dark green. It feeds on dock, dandelion, groundsel, etc. ; also on sallow and hawthorn, from April to June. The moth is out in August and September. It prefers the open country to woodlands, and is often seen resting on rocks, stone, or other walls, and buildings. Except that it occurs in Devon and Dorset, the species seems to be absent in the south of England, but its area of distribution extends in the British Isles from the Midlands of England to Moray and Ross in Scotland, and to Ireland.

The Black-banded (*Antitype xanthomista*).

The form of this species occurring in Britain is var. *nigrocincta*, Tr. (Plate 140, Figs. 2, 3), which is pale grey, spotted with white, and clouded on the central area with black. The typical yellow flecking and dotting is in this form usually sparse, but occasionally it is prominent. A specimen reared from a caterpillar taken in the Isle of Man was suffused on the fore wings with bright orange.

The caterpillar is ochreous brown, varying in tint, above and pale green below the brown spiracles ; the head is rather yellowish and very glossy. It feeds on sea thrift (flowers), and plantain in its haunts, which are the rocky coasts of Cornwall, North Devon, and the Isle of Man. In confinement it will eat groundsel, dock, dandelion, lettuce, etc. Usually the caterpillars do not hatch out until the spring, and then feed until June or July ; but they have been known to hatch in the autumn, and then to hibernate. The moth flies in August and September, but, although it has been taken at sugar and light, is more frequently reared from caterpillars, which are readily found at night by those who may undertake the sometimes

hazardous business of collecting them. The earliest known British specimen was taken at a lighthouse near Padstow in Cornwall, and five years later the moth was bred from a caterpillar found in the Isle of Man. In 1880 a specimen was taken at sugar in the middle of a small wood in South Pembrokeshire. According to Hampson this, and the other two species usually included in *Polia*, are referable to *Antitype*, Hübn. On the same authority *nigrocincta*, Treit., is the earlier name for the present species, but the figure of *xanthomista*, Hübner, was published in 1818–1819 and this name stands.

The Sprawler (*Brachionycha sphinx*).

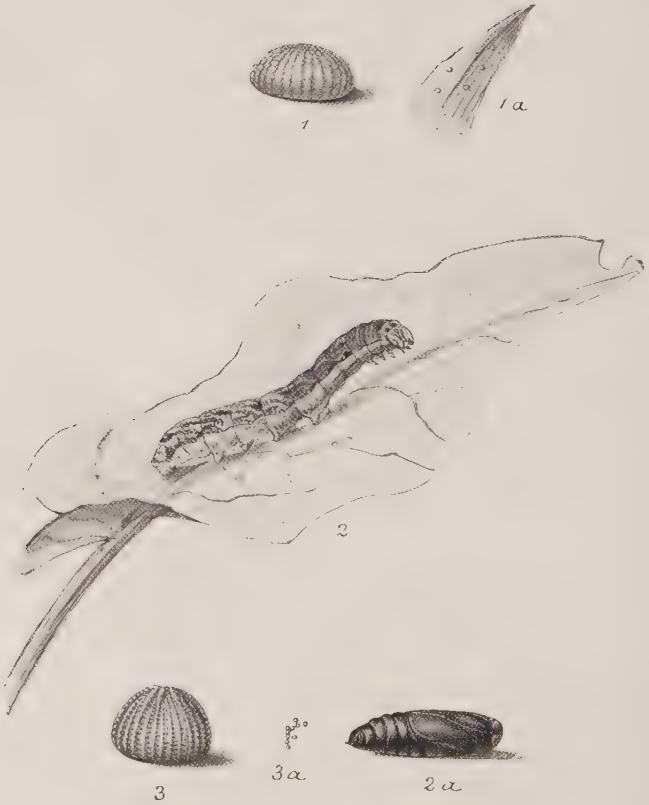
The black streaked and dotted, pale brownish grey moth (Plate 138, Fig. 8) occurs, more or less locally, in most of the English counties from Norfolk, Huntingdon, and Oxford, southwards; and from Gloucester northwards through Hereford and Worcester, to Cheshire, Lancashire, Yorkshire, to Darlington in Durham, and Cumberland. It is, however, rare in the northern counties. The caterpillar is yellowish green; three whitish lines on the back, the central one broadly edged with green on both sides, and the others inwardly by a dark line; the front ring is edged with whitish, and the head is greenish. It feeds on the foliage of various trees, including oak, beech, elm, ash, sallow, lime in May and June. The moth flies in November and December. Rather rare in Ireland.

The Rannoch Sprawler (*Brachionycha nubeculosa*).

The first British specimen was taken at Rannoch in the spring of 1854, and in that Perthshire locality the species is still to be found, sitting on the trunks of the birch trees in late March and in April. It has frequently been reared from the

Pl. 138. *T* 288.

1. **Brindled Ochre Moth.**
4, 5. **Grey Chi Moth,** *var. olivacea.*
8. **Sprawler.**
2, 3. **Grey Chi Moth.**
6, 7. **Large Ranunculus.**



Pl. 139. *U* 289.

1, 1*a*. **Black-banded Moth:** *eggs, natural size and enlarged.*
2, 2*a*. **Gothic Moth:** *caterpillar and chrysalis.*
3, 3*a*. **Black Rustic:** *eggs, natural size and enlarged.*

egg, but the caterpillars must be sleeved out on growing birch, or the mortality among them may be high. Even if they attain the chrysalis stage, the moth may not appear the following spring, as it has a habit of remaining in its shell for two winters, and sometimes more. (Plate 140, Figs. 1 ♂, 4 ♀.)

The caterpillar is yellowish green, whiter on the back; the third ring is obliquely marked with yellow on each side; the eleventh ring is slightly raised and marked yellow, and there is an oblique yellow mark above the claspers; spiracles white edged with black, and the usual dots are pale yellow. It feeds on birch. May and June.

The Green-brindled Crescent (*Meganephria oxyacanthæ*).

This moth, which in its typical form was known to the ancient fathers of entomology as "Ealing's Glory," is shown on Plate 141, Fig. 2. The var. *capucina*, Mill (Fig. 3), a purely British production by the way, has the fore wings dark sooty brown, inclining to blackish. The caterpillar, which has a white-marked and divided hump on ring eleven, is reddish or greyish brown, with dark grey and greenish mottling; the back has three darker lines along it, and there is a sort of diamond pattern in greyish between the outer ones; rings three and ten striped with black; head reddish brown. It feeds in April and May on hawthorn, sloe, crab, and apple. Widely distributed throughout the British Isles, but apparently not found north of Moray in Scotland.

The Double-spot Brocade (*Meganephria bimaculosa*).

Stephens, referring to this species in 1829, states that he had only seen one British specimen. This was in the British Museum, "to which it was presented by Dr. Leach; it was captured near Bristol, I believe, in July, 1815." Barrett notes

a specimen, said to have been taken by Peter Bouchard, in the collection of the late Dr. Mason. This is all that there seems to be known concerning this species in Britain. The specimen figured on Plate 141, Fig. 4, is continental.

The Merveille du Jour (*Griposia aprilina*).

The pretty green moth, with white-edged black markings, shown on Plate 141, Fig. 1, is widely distributed over the greater part of the British Isles. It occurs in oak woods, or in localities where oak trees are plentiful The caterpillar is of an obscure greenish-grey coloration, sometimes inclining to brownish; a white line along the back, and a dark one low down on the sides; over the back spreads a series of blackish marks showing a more or less diamond pattern. It feeds in the spring and until June on oak leaves, and often rests by day on the trunks, in the chinks of the bark. The moth flies in September and October, rather earlier in Scotland.

Flame Brocade (*Trigonophora flammea*).

The earliest record of this species (Plate 141, Fig. 6) in England dates back to 1855, when five specimens were obtained at sugar in a locality near Brighton, in Sussex. The next year, and subsequently, it was found, not only in the original place. but also in the Lewes and Shoreham districts. Later it was met with in other localities in the county, and for several years captures were made in most of its known haunts. For some years past, however, it seems to have disappeared from Sussex, and is not known to occur in any other part of the British Isles.

The caterpillar is ochreous brown, tinged with reddish; a dull brownish diamond pattern, and three lines along the back, the central line paler than the others; the spiracles and usual dots are white, ringed with brownish. Another form is green,

Pl. 140.

U 290

1, 4. **Rannoch Sprawler.**
2. 3. **Black-banded Moth.**

Pl. 141. U 291.

1. **Merveille-du-Jour Moth.**
2, 3. **Green-brindled Crescent.**
4. **Double-spot Brocade.**
5. **Small Angle Shades.**
6. **Flame Brocade.**
7. **Angle Shades.**

as also are both forms in the younger stages. It feeds from December to April on pilewort (*Ranunculus ficaria*), *R. repens*, and other kinds of buttercup. When full grown it is said to prefer ash or privet. The moth flies in late September and October.

The Small Angle Shades (*Euplexia lucipara*).

The pale reniform mark on the outer edge of the blackish central area is the prominent feature of this pinkish- or purplish-brown moth. (Plate 141, Fig. 5.) The caterpillar is green, or pinkish-brown, and velvety in appearance ; three indistinct lines and some dusky V-shaped marks on the back ; a white line along the sides; usual dots white, and the spiracles black. It feeds in August and September on most low plants, birch, sallow, bracken, etc. It is often destructive to ferns in the garden or conservatory ; usually selecting the choicer kinds, and as its depredations are carried on only at night, the culprit escapes detection. The moth flies in June and July, and a few specimens sometimes appear in the autumn. Generally distributed and often common in the South. The range abroad extends to Amurland, Japan, and North America.

The Angle Shades (*Phlogophora meticulosa*).

The moth shown on Plate 141, Fig. 7, is, when newly emerged from the chrysalis, an exceedingly pretty creature. After death the pinky-brown colour remains, but the olive green of the triangular central band, and border of outer margin, fades and distinctly mars the pleasing effect of the general colour scheme. Sometimes the central band and outer border are red, and in such specimens the ground colour is more rosy. The caterpillar is green or brown, minutely dotted with white ; a pale central line and dusky V-shaped marks on each side of it ; the outer arm of the V more distinct than the inner ; the line along the dark

ringed spiracles whitish; head green or brown freckled with darker. It feeds on groundsel, dock, bracken, and almost anything in the way of an herbaceous plant; often attacks geraniums in the greenhouse as well as outdoors. Has been found in almost every month of the year, but perhaps most common in July, August, and September. The moth also occurs at all seasons of the year, but seems to be most frequent in May and June, and sometimes in September and October. It is found throughout the British Isles. Both this species and the last mentioned, when resting on herbage, paling, or tree stem, chiefly the former, sit with the wings folded in to the body, but each fore wing is broadly wrinkled or folded throughout its length. In this position the moth is very like a crumpled decaying leaf, and for such may be readily mistaken.

The Old Lady (*Mormo maura*).

From its habit of creeping behind curtains, shutters, etc., and otherwise disposing itself in dwelling-houses during the day, as well as in summer houses and other buildings, this moth (Plate 142, Figs. 1 ♂, 3 ♀) must often come under observation. The caterpillar is ochreous brown with a darker diamond pattern on the back; the central line is ochreous, but much broken, and on each side of it there is a series of pale oblique streaks; the spiracles are reddish ochreous, edged with black, and the line along them is ochreous; head pale brown, glossy. The general colour varies to greyish or purplish brown. It feeds on various low herbage in the autumn, and on the young shoots and leaves of sallow, hawthorn, birch, etc., in the spring after hibernation. The moth flies in July and August, and is generally common in the south of England. Sometimes it abounds even in the London suburbs, and in 1904 it was seen pretty frequently during August flying, in the evening, low down along the roads and in gardens all over the southern district. The species is also

found more or less frequently throughout England northwards, and well into Scotland, as least as far as Clydesdale. Renton records it as common at sugar in Roxburghshire, and White gives the Forth and Tay districts. Widely distributed in Ireland, common in some parts.

The Gothic (*Phalæna typica*).

This moth (Plate 142, Fig. 2) is common in gardens, as well as along the weedy wayside and hedgerow in all parts of England and Wales, Scotland to Sutherland, and in Ireland. The caterpillar (Plate 139, Fig. 2) varies in colour from brownish-grey to pale ochreous brown, or greenish grey, freckled with darker; three pale lines on the first ring, and partly on the second ; some pale oblique streaks on the sides, and blackish marks on rings ten and eleven, the latter more or less united behind ; head of the body colour darker marked. It feeds on all kinds of herbage, also on the leaves of sallow, sloe, apple, etc. When young in large companies on the underside of leaves. August to May. The moth flies in June and July.

The Crescent (*Celæna leucostigma*).

Of this purplish-brown species the typical form (Fig. 1), and the pale banded form, var. *fibrosa*, Hübn., are shown on Plate 143. The caterpillar, according to Buckler, is slaty brown, inclining to olive drab above ; three paler lines on the back ; the spiracles are black and the usual dots black-brown ; head warm brown, very glossy ; plate on first ring glossy black, that on the last ring blackish brown. It feeds in the stems of *Cladium mariscus*, sedge (*Carex paludosa*), and yellow flag (*Iris pseudacorus*). May to July. The moth is out in late June, July, and August. It inhabits fens and marshy ground, and seems to be found in such localities throughout the British Isles, including the

Hebrides and Shetlands. Abroad the range extends to Amurland, China, Japan, also North America.

The Ear Moth (*Hydræcia oculea*).

On Plate 143 are shown a more or less typical specimen of this species (Fig. 3); the reddish spotted var. *erythrostigma*, Haw. (Fig. 4); and two examples of the marsh or saltern form, *paludis*, Tutt (Figs. 5, 6), for which specific rank has been claimed. Specimens found in marshes, especially those by the sea, are usually somewhat larger than normal, but I cannot see that they otherwise differ from forms of *oculea*. The caterpillar is greenish pink with pinkish grey stripes on the back and sides; spiracles black, and usual dots dark brownish; head pinkish ochreous, plate on ring one of the body yellowish brown. It feeds from May to August on grasses, chiefly the lower part of the stems. The moth flies in August and September, and is sometimes seen in the daytime on the flowers of thistle and ragwort, etc., but far more frequently at night, when it also visits sugar more or less freely. Usually common in marshy places throughout our islands. The range abroad extends to Amurland, Corea, Japan, and North America. (See Appendix.)

The Rosy Rustic (*Hydræcia micacea*).

This moth (Plate 143, Figs. 8, 9) is also widely spread over the British Isles, occurring most freely on the coast, but not uncommonly inland. It appears in the autumn, and is frequently seen at light, and although not very partial to sugar it occasionally visits that attraction as well as ragwort blossom, etc. The caterpillar is dull smoky pink, with a faintly darker central stripe; the usual dots dark brown, and the spiracles black; head, and plates on first and last rings of the body ochreous brown. May to August on dock, plantain, feeding in

Pl. 142. *U* 294.

1. 3. **Old Lady Moth.**
2. **Gothic Moth.**

Pl. 143.

U 295.

1, 2. **The Crescent.**
3, 4. **Ear Moth.**
5, 6. **Ear Moth,** *saltern form.*
7. **Butterbur Moth.**
8, 9. **Rosy Rustic.**

the stems and down into the roots. Sometimes it attacks the potato, eating down the stalk into the tuber. The range abroad extends to Amurland.

The Butterbur (*Hydræcia petasitis*).

This is a larger species than the last, and more dingy in coloration. Its chief haunts, among the butterbur (*Petasites*), are in the northern counties from Cheshire to Durham. It was first met with by Stainton in 1846 at Falkirk in Scotland, and Doubleday named and described it in 1847. An account of its caterpillar feeding in the roots of the butterbur was published by N. Cooke in 1850, and by 1855 the northern collectors had reared and distributed large numbers of the moths among their confrères in other parts of the country. The species is still common in the north of England, but continues scarce and very local in Scotland. Odd specimens have been reported from the eastern counties and once from Somerset. The caterpillar is greyish white with black dots; head, and plate on first ring of the body brown. July and August. The moth occurs among its food plant in August and September. (Plate 143, Fig. 7.)

The Frosted Orange (*Gortyna flavago*).

Except that it sometimes visits a strong light, and may then be captured, this moth (Plate 144, Figs. 1 ♂, 2 ♀) is most easily obtained in its early stages. The caterpillar is pale ochreous white with conspicuous black dots; head ochreous brown, the plate on first ring of the body is blackish with white lines upon it. It feeds in the stems of thistles, burdock, hemp-agrimony, etc. April to July, or later. The brownish chrysalis may be found in stems of the plants, generally low down near the ground. The moth, which is common in some years, occurs from August to October in most places, especially marshy ground, where

thistles flourish, throughout England and Wales. It is found in Scotland up to Perthshire and Aberdeen. Also recorded from Ireland.

Reed Wainscot (*Nonagria algæ*).

This moth (Plate 144, Fig. 4) varies in size and also in the colour of the fore wings, which range from a pale ochreous, through reddish shades, to sooty brown. The cross lines are indicated by black dots. The black dotted greenish caterpillar has a brown head and a whitish green plate on first ring of the body. It feeds from May to July in the stems of reed-mace (*Typha latifolia*), often called the bulrush or catstail; also in the true bulrush (*Scirpus lacustris*). Fig. 5, Plate 148, shows the chrysalis in its characteristic position when in the stem, that is with the head upwards. The moth flies, in August and September, at dusk, over and among the reeds; the males especially freely responding to the attraction of light. Its chief localities are in the fens of Norfolk and Suffolk, but it has also occurred in Mid-Sussex and Surrey.

Webb's Wainscot (*Nonagria sparganii*).

This moth also varies in the colour of the fore wings, from almost whitish through various shades of ochreous and red. The main veins are shaded with grey, and the median one has black dots upon it, chiefly at the end of the cell; the outer margin with a row of large or small black dots. (Plate 144, Fig. 3.) The caterpillar is yellowish green with darker lines; head and plate on first ring of the body pale brown. It feeds in July and August in stems of bur-reed (*Sparganium*), reed-mace, and yellow flag. Fig. 6, Plate 148, shows the chrysalis in its natural position in the stem. The hole in the stem from which the moth escapes is also clearly in evidence above the chrysalis.

The moth flies among reeds, etc., in August and September. Its chief localities in England are in East and South-east Kent, in which county the first British specimens were obtained by Mr. Sydney Webb in 1879. In 1899 a specimen reared from a caterpillar found in a stem of *Typha*, was recorded from Suffolk (Woodbridge district); also in Sussex, Hampshire, Devon, Dorset, and Isle of Wight. It is also not uncommon "between Old Head of Kinsale and Glandore," Co. Cork, Ireland.

The Bulrush Wainscot (*Nonagria typhæ.*)

The fore wings of this species (Plate 144, Fig. 5), usually of a pale whity-brown colour, in some specimens are reddish tinged; or they may be almost uniformly reddish brown or blackish (var. *fraterna*, Treit.). The row of black spots on the outer area are wedge-shaped and are placed just before the margin. The caterpillar is pale ochreous more or less tinged with pink; a paler line along the spiracles; head and plate on first ring of the body red-brown. July to August, in stems of *Typha*. The moth flies in August and September, and although it may be netted when on the wing at dusk, or at light, it is obtained in better condition by rearing it from the chrysalis, which may be found in the stems (Plate 148, Fig. 3), those of the previous year for choice, of reed mace. Generally distributed in England up to Yorkshire; it has been recorded also from Northumberland and the Scottish border. It is common in southern Ireland, and found northwards up to Sligo, Tyrone, and Armagh.

The Twin-spotted (*Nonagria geminipuncta*).

This species, shown on Plate 144, Figs. 6, 7, varies in colour from pale brown, more or less suffused with grey, through darker, or reddish brown to blackish (var. *nigricans*, Staud.).

In the brown typical form the reniform mark is represented by two dark-edged white dots, the upper one often tiny or absent (var. *unipuncta*, Tutt), or both may be absent (var. *obsoleta*, Tutt). The caterpillar in pale ochreous, pink-tinged, a pale line along the spiracles; head dark brown. May and June, in stems of reeds (*Phragmites*). The chrysalis lies in the reed stem with the head towards the oval hole above it from which the moth escapes. In August the moth may be found in its haunts in the south and east of England. These are marshes, often near the sea, in Cambridgeshire, Suffolk, Essex, the Thames valley, Sussex, Hants, and the Isle of Wight, Wiltshire and Somerset.

The Brown-veined Wainscot (*Nonagria dissoluta*).

The popular name applies more especially to the ordinary form of this species known as *arundineta*, Schmidt. (Plate 144, Fig. 8.) The dark brown or black typical form (*dissoluta*, Treit. = *hessii*, Boisd.) is local and uncommon; in fact until 1900 it had not been noted in England for a number of years, and specimens were only known from Yaxley. In the year just mentioned however, several examples of it were recorded from Suffolk, taken in the Needham Market district; and in 1905 specimens were reported from the East Kent marshes. Var. *arundineta*, the *neurica* of some authors, occurs in the fens of Norfolk, Suffolk, Cambridge, Lincolnshire, Essex, Yorkshire, Sussex, and Kent; and is said to have been taken in Middlesex and Lancashire. The caterpillar is dirty white, light reddish on the back; raised dots black inclining to brown on front three rings; spiracles white edged with black; head dark brown, plate on first and last rings of the body brownish grey. It feeds in June in the stems of reed and turns to a chrysalis in the lower part of the stem, head downwards in the direction of the exit hole below it. (Plate 148, Fig. 1.) The moth flies in July and August.

Pl. 144. U 298.

1, 2. **Frosted Orange Moth.** 3. **Webb's Wainscot.**
4. **Reed Wainscot.** 5. **Bulrush Moth.**
6, 7. **Twin-spotted Wainscot.** 8. **Brown-veined Wainscot.**
9. **Fenn's Wainscot,** 10 *aberration sinelinea.*

Pl. 145. *U.* 299.

1, 2. **Large Wainscot.**
5, 6. **Flame Wainscot.**
9, 10, 11. **Small Rufous Moth.**
3, 4. **Fen Wainscot.**
7, 8. **Silky Wainscot.**
12, 13, 14. **Small Wainscot.**

The Small Rufous (*Cœnobia rufa*).

Varies from pale ochreous white, through reddish shades, to a greyish brown. (Plate 145, Figs. 9 to 11.) The caterpillar is described by Hofmann, as pale reddish above and whitish below, with minute dark dots on the back and a fine blackish line along the sides; head and plate on first ring of the body brown and glossy. May and June, in stems of the jointed rush (*Juncus lamprocarpus*). The moth flies in July and August, and occurs in fens and marshes. At one time it was not uncommon in marshy localities around London, and it is still to be obtained in Richmond Park, Surrey. In some years it abounds in the Norfolk and Cambridge fens, and in others is hardly seen. It is also to be found more or less frequently but always local in Suffolk, Essex, Berks, Kent, Sussex, Isle of Wight, Dorset (Isle of Purbeck), Devon, Somerset, Gloucester, North and South Wales, Cheshire, and Yorkshire; Argyllshire in Scotland; Ireland.

The Silky Wainscot (*Chilodes maritima*).

In its typical form (Fig. 7) the moth shown on Plate 145 is whity-brown, clouded with grey and sometimes tinged with brownish on the disc. The orbicular and reniform stigmata are round and faintly outlined in whitish. In var. *bipunctata*, Haworth, the stigmata are black and conspicuous: var. *wismariensis*, Schmidt, has a blackish central streak from the base broadening out towards the outer margin (Fig. 8): var. *nigristriata*, Staud., has the fore-wings finely streaked with black; and var. *nigrocostata*, Staud., has the front margin broadly black. The caterpillar is ochreous grey with three fine interrupted, whitish lines on the back; spiracles black with darker lines along their area; head dark brown and shining. September to May, hiding by day in stems of reed (*Phragmites*) and at night

feeding on the caterpillars and chrysalids of other reed insects (Hofmann). The moth flies from late June to early August. It occurs in the fens of Norfolk and Cambridge, but in the former county it has been taken at Merton and King's Lynn. Dr. Wheeler states that it is usually found in the thicker reed beds where stems of the previous year's growth still remain. Other localities are Hunts, Essex, Herts, Suffolk, Surrey, Kent, Sussex, Dorset, Devon, and Isle of Wight. (See Appendix.)

The Flame Wainscot (*Meliana flammea*).

The original British specimen, which Curtis in 1829 named, described, and figured, was stated to have been taken "near Lewisham, towards Lee, in July." Now it is only known to occur in Dorset, Norfolk, and Cambridgeshire, chiefly in the fens; in Wicken fen in the latter county it is most plentiful. (Plate 145, Figs. 5, 6.) The caterpillar is greyish ochreous brown, rather paler beneath, with paler lines along the back and sides, the central one edged on each side with darker; spiracles whitish, outlined with black, and a greyish drab spiracular stripe with paler edges; head shining, and faintly netted with darker grey. (Condensed from Buckler.) Hides by day in the old stems of reed (*Phragmites*), and feeds at night on he leaves, August to October.

The Small Wainscot (*Arenostola pygmina*).

The fore wings vary in colour from almost whitish through various shades of grey brown and reddish brown (Plate 145, Figs. 12 to 14). The caterpillar, pale shining pinkish ochreous; central stripe pale, bordered on each side with greyish brown. Head pale brown, marked with darker, shining. June and July in stems of sedges (*Carex*). The moth flies in August and

September, and is found in fens and marshy ground pretty well all over the British Isles, including the Hebrides.

The Concolorous (*Arenostola extrema*).

This species (Plate 146, Fig. 3) was at one time subsequent to 1844, when it was first discovered in Yaxley Fen, not at all scarce in that locality and in other fens in Huntingdonshire and Cambridgeshire. It then disappeared from all its old haunts, some of which were destroyed; but a few years since it was met with again in Hunts, and Northants. (See Appendix).

Bond's Wainscot (*Arenostola morrisii*).

The whitish moth shown on Plate 146, Fig. 4, was first taken at Charmouth by F. O. Morris and was named after him by J. C. Dale. It was described by Morris in the Naturalist for 1837, vol. II, p. 88, and was then thought to be a form of the Small Dotted Buff (*P. minima*). In 1859 Dr. Knaggs took it at Folkestone and named it *bondii*. It also occurs at Lyme Regis and Sidmouth.

The caterpillar is dirty white in colour inclining to brownish at each end; a whitish line along the middle of the back; head brown. Feeds from August to June in stems of *Festuca arundinacea*. The moth flies in June and July.

The Mere Wainscot (*Arenostola fluxa*).

Present localities for this reddish species (Plate 146, Figs. 1, 2) are Wicken and Chippenham fens, Shelford, and Whittlesford, in Cambridgeshire; Monk's Wood in Hunts. Formerly Yaxley, where it was first taken in 1847, used to be a noted locality, but the insect disappeared when the fen was drained. It has been reported from Norfolk (Yarmouth), Lincolnshire, Devonshire (Dartmoor), and Hertfordshire (Hitchin), chiefly in odd specimens. The caterpillar has been described by Hofmann as yellowish-white, or reddish above and paler beneath; plate

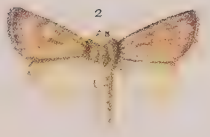
on first ring of the body rather glossy, head glossy yellow brown. It lives from autumn to June of the next year in stems of the wood smallreed (*Calamagrostis epigeios*). The moth flies in July and August. (See Appendix.)

The Lyme Grass (*Arenostola elymi*).

The more or less brownish-tinged, whitish-ochreous species shown on Plate 146, Figs. 5, 6, was not recorded as a British insect until 1861. It is now known to occur in England in many localities, but all on the east coast from Norfolk to Durham. In the *Entomologist* for 1894, it is recorded as occurring at Montrose on the Forfarshire coast in Scotland. The caterpillar is described by Buckler as pale flesh colour, with a rather darker stripe along the back; spiracles black; head reddish-brown, shining; shining yellowish-brown plates on the first and last rings of the body. It feeds on the stems of lyme-grass (*Elymus arenarius*) in May and June. The moth flies at early dusk over and among its food plants, and later on it settles on the stems, from which it may be easily boxed.

The Brighton Wainscot (*Oria musculosa*).

This yellowish-clouded, whitish insect is a native of Southern Europe, Asia Minor, Syria, and North-west Africa. Occasionally it has occurred in England, and in the time of Haworth and Stephens one or two specimens seem to have been recorded as British. In 1855 an example was captured at Brighton, and others occurred in the same locality, and at Bexhill, Kent (Jenner), between that year and 1860. A specimen was recorded from Brighton in 1883, and one from South Devon in 1899. Reported from Wiltshire in 1910. (Plate 146, Fig. 7.)



Pl. 146. *U* 302

1, 2. **Mere Wainscot.** 3. **The Concolorous.**
4. **Bond's Wainscot.** 5, 6. **Lyme Grass Moth.**
7. **Brighton Wainscot.**

Pl. 147. *U* 303.

1, 2. **Common Wainscot.**
5. **Southern Wainscot.**
7, 8. **Obscure Wainscot.**
3, 4. **Smoky Wainscot.**
6. **Striped Wainscot.**
9. **Devonshire Wainscot.**
10. **Shoulder-striped Wainscot.**

The Large Wainscot (*Arenostola lutosa*).

This species, shown on Plate 145, Figs. 1, 2, varies somewhat in the colour of the fore wings, which is usually pale ochreous brown, but may be more or less reddish tinged, or clouded with dusky; there is a row of black dots beyond the middle of the wing, but these are sometimes faint or absent. The range in size is considerable, some specimens are about the size of *L. straminea* whilst others will equal that of a large *N. typhæ*. Haworth described two forms, *pilicornis* and *crassicornis*.

The caterpillar is whitish tinged with pink above, and with a dusky line along the back; head reddish brown and glossy; plates on first and last rings of the body shining pale brown. It feeds from April to June in the roots of reed (*Phragmites*), causing the leaves of the affected stems to whiten. The moth flies in August, September, and October, sometimes later, and occurs in marshes, and on the banks of streams and ditches, in most of the southern and eastern counties of England, and from Derbyshire to Durham; in Scotland it has been recorded from Roxburghshire (near Kelso, rare), Perthshire, Aberdeen, and Shetland. The species is widely spread in Ireland.

The Fen Wainscot (*Arenostola phragmitidis*).

In the typical form this species (Plate 145, Figs. 3, 4) the fore wings are whitish on the basal half, and incline to reddish on the outer half; var. *rufescens*, Tutt, has these wings reddish all over, but somewhat darker on the outer margin. The caterpillar is ochreous white with a slightly paler stripe along the back, edged on each side with purplish; the spots are black, as also are the spiracles; head and plates on the first and last rings of the body black or blackish brown, glossy. It feeds from August to June in stems of reed (*Phragmites*), and is said

to hatch from the egg in the autumn. The moth flies in July and August, and is fond of the flowers of grasses growing in its marshy haunts. It is common in the Norfolk and Cambridge fens, and is found in suitable locations in Huntingdon, Northampton, Lincoln, Yorkshire, Cheshire, and South Lancashire, also in Berkshire, Suffolk, Essex, Kent, and Sussex.

The Common Wainscot (*Leucania pallens*).

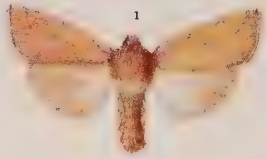
This common, often abundant species (Plate 147, Figs. 1, 2) is pretty generally distributed over the British Isles. The typical coloration is pale ochreous ; ab. *arcuata*, Stephens, is pale brownish ochreous ; ab. *ectypa*, Hübn. = *rufescens*, Haworth, is reddish ; and ab. *suffusa*, Stephens, is also reddish, but powdered with blackish scales between the veins, and chiefly so under the median nervure. The hind wings in all forms are white in both sexes ; but sometimes slightly tinged with greyish on the outer margin in the female. The caterpillar (Plate 152, Fig. 1) which feeds on grasses from August to May, is pale whity-brown freckled above with pinkish brown ; three whitish lines along the back, the central one narrowly edged on each side, and the others on the inner side only, with blackish ; a greyish stripe along the sides with two pinkish brown lines above it ; dots, minute, black ; head freckled with dark brown. Distribution abroad extends to Amurland.

Mathew's Wainscot (*Leucania favicolor*).

This species (Plate 149, Figs. 1, 2) has been mainly found on the coasts of North-east Essex and South-east Suffolk, but it has also been taken at Hemley in Suffolk, and has been recorded from near Southend in Essex, and Rochester in Kent. In 1906 six specimens were captured in the Isle of Sheppey. So far as is known at present this is its range in England, and

Pl. 148. *U* 304

1, 1*a*. Brown-veined Wainscot: *egg and chrysalis.*
2. Twin-spotted Wainscot: *egg, enlarged.* 3. Bulrush Moth: *chrysalis.*
4, 4*a*. Fenn's Wainscot: *caterpillar and chrysalis.* 5. Reed Wainscot: *chrysalis*
6. Webb's Wainscot: *chrysalis.* 7. Devonshire Wainscot: *caterpillar.*



Pl. 149. *X* 305.

1, 2. **Mathew's Wainscot.**
1. **The White Speck.**
3. **The Delicate.**
5. **The White Point.**
6. **The Cosmopolitan.**

it does not seem to occur anywhere abroad. It was first discovered by Paymaster-in-Chief G. F. Mathew, in 1895, and was described by the late Mr. C. G. Barrett in 1896.

In the typical form the fore wings are of a smooth soft honey colour, or colour of the honeycomb, having the nervures faintly perceptible, but not paler; a black discal dot, and two more dots with some faint blackish dashes indicate the usual second line. Tutt has named several forms, the most important being ab. *lutea*, bright yellow buff with discal dot and two dots beyond; and ab. *rufa*, deep reddish with discal dot and two others beyond. Besides these there are ab. *ænea*, Mathew, deep orange, with only one dot representing second line; and ab. *obscura*, Mathew, cinnamon-brown, with smoky shading between some of the nervures. The hind wings vary from whitish with darker nervures, to smoky grey; but the fringes always remain whitish.

The caterpillar is a warm putty colour, or pinkish brown, mottled and shaded with darker shades; three pale whitish brown lines on the back, the central one bordered on each side by a darker shade, and the outer ones shaded inwardly with darker and edged below by a darker line; a brown or pinkish stripe above the spiracles, and a pinkish yellow stripe below them; head yellowish-brown, shining, and dotted with darker colour. It feeds on grasses from July to April (adapted from Mathew). The moth flies in June and July, and frequents the flowers of the large grasses growing on salt marshes. Sometimes specimens of a second brood appear in August or September.

The Smoky Wainscot (*Leucania impura*).

The range of this common species (Plate 147, Figs. 3 ♂, 4 ♀), in the British Isles is almost the same as that of *L. pallens*, but it does not extend further north than Moray in Scotland. The hind wings are greyish or blackish grey. A form with reddish

fore wings is var. *punctina*, Haw., which sometimes has a row of black dots on the outer margin. The caterpillar is greyish ochreous above, greenish tinged beneath; a brown stripe along the middle of the back is intersected by a very fine white line; above the reddish black-edged spiracles is a brownish stripe; usual dots black; head pale brown, shining, netted with brown and lined with blackish. It feeds on grasses from August to May. The moth is out in July and August: rather later in the north. Distribution abroad extends to Amurland and Japan.

The Southern Wainscot (*Leucania straminea*).

In its more usual form this species (Plate 147, Fig. 5) has pale whity-brown or pale straw-coloured fore wings, and the black dots forming the second line not infrequently absent, at least as regards some of them. Var. *rufolinea*, Tutt, has the fore wings reddish ochreous, the rays whitish, and the shade under the median nervure reddish. Var. *nigrostriata*, Tutt, has the ground colour of the fore wings obscured by a thick powdering of black scales. The hind wings in all forms are whitish, sometimes greyish tinged. Generally there is a central black dot, and a more or less complete series of black dots beyond it; but some, or all, of these dots may be absent. The caterpillar, which feeds on the leaves of reeds, *Phalaris*, and other coarse grasses from October to May, is ochreous with an orange tinge, and dusted with grey; three white lines on the back are broadly shaded with bluish grey; on the sides are two grey shaded white lines; head shining brownish ochreous (Fenn). The moth flies in July and August, sometimes earlier.

Hammersmith Marshes, a once noted locality for this, the Obscure Wainscot, and other good species, have long since been built over; but the present insect, and perhaps some of the other ancient inhabitants of the said marshes, possibly still occur along the banks of the Thames. Anyhow, it does lower

down in the Kentish marshes. It is found in most of the eastern counties from Essex to Huntingdon and Lincoln, and also, but less frequent, in Sussex, Devon, and Cornwall. Kane gives Dromoland, Co. Clare, and Enniskillen, Co. Fermanagh, Ireland; and Donovan adds Sligo and Cork.

The Striped Wainscot (*Leucania pudorina*).

This is a rather larger insect than either of the last four species. The fore wings are whitish ochreous, powdered with blackish scales, and often tinged with pinkish. The black shading along the median nervure is sometimes very conspicuous. The caterpillar is ochreous brown, with three blackish-edged whitish lines on the back and dark stripes along the sides; head pale brown marked with darker. It feeds on the leaves of the reed (*Phragmites*) in June. The moth flies in July and August in fens, boggy heaths, and marshy ground, and is found in such places in most of the eastern counties, in Yorkshire, and from Berkshire and Kent to Devon, also in South Wales and in Galway, Cork, and Kerry, Ireland. Abroad the range extends to Siberia and Amurland. (Plate 147, Fig. 6.)

The Obscure Wainscot (*Leucania obsoleta*).

This species (Plate 147, Figs. 7 ♂, 8 ♀) will be recognized by the fine blackish lines on the fore wings, the white dot at lower end of the cell, and the row of black dots representing the second cross line. It is a very local species, chiefly found among reeds in Norfolk and Cambridgeshire, and may also occur in marshy places along the banks of the Thames from Bucks to Kent. The caterpillar is greyish ochreous above and paler beneath; three white lines on the back, the central one edged with greenish on each side, and the others edged with brownish; the line along the black-edged spiracles is greyish; head pale

brown striped with darker. It feeds from August to October on the leaves of the reed (*Phragmites*), hiding by day in the stems. It also hibernates in the reeds when full grown, but does not change to the chrysalis state until the spring. The moth flies in June and July. Also occurs in Huntingdon and Sussex.

The Shore Wainscot (*Leucania littoralis*).

The white line running through the pale ochreous brown fore wings is the chief character of this species. (Plate 150, Figs. 4, 5.) The caterpillar (Plate 152, Fig. 2) is whity-brown with three lines on the back, the central one is whitish, shaded with dusky on each side, the others brown edged with whitish ; the spiracles are whitish, outlined in blackish ; head, and plate on first ring of the body, bone colour, shining. It feeds from August to May on marram grass (*Psamma arenaria*), but will eat meadow grass (*Poa*) and other kinds in confinement. The moth is out in June and July, sometimes earlier or later. It is a coast species, occurring only on sandhills where the marram grass flourishes, and in such localities is found all round England and Wales ; on the east coast of Scotland to Forfarshire, and on the west to Clydesdale and Arran ; and in Ireland on the north, south, and east coasts.

Fenn's Wainscot (*Arenostola brevilinea*).

On Plate 144, Fig. 9 represents the type of this specimen, and Fig. 10 ab. *sinelinea*, Farn. This form, which has also been referred to as "*alinea*," is without the typical black streak at the base of the fore wings. The caterpillar is pale ochreous almost obscured by thick reticulations of olive brown ; dorsal, subdorsal, and spiracular lines broad, pale yellow, the last being the palest, with central stripes of orange. Ventral area paler, head light

Pl. 150. *X* 308.

1, 2. **Brown-line Bright-eye Moth.**
4, 5. **Shore Wainscot.**
3, 5. **Double-line Moth.**
7, 8. **Clay Moth.**

Pl. 151. X 300.

1, 2, 3. **Treble Lines Moth.**
4. **Anomalous Moth.**
5. **Mottled Rustic.**
6. **Uncertain Moth.**
7. **Rustic Moth.**
8. **Vine's Rustic.**
9, 10. **Pale Mottled Willow.**
11. **Small-mottled Willow.**

brown with darker markings near top of lobes (Fletcher). It feeds in the upper part of reed stems until nearly full grown, and then upon the leaves. April to July. Barrett states that it prefers the reeds near small trees or bushes to those growing in masses. The moth is out in July and August, and may be netted as it flies at dusk along the edges of the reed beds, etc. ; later on it resorts to the honeydew-covered leaves of sallow and alder, and also visits light. This species was first taken in 1864 at Ranworth in Norfolk ; it is now obtained in Barton Broad and several other localities in the Norfolk fens, but not in any other part of the British Isles. It does not appear to occur abroad.

The Shoulder-striped Wainscot (*Leucania comma*).

The striking features of this moth (Plate 147, Fig. 10) are the white median nervure, and the black streak below it, of the fore wings ; there are also black marks on the veins before the outer margin. The caterpillar is very like that of *L. impura*, but there is a dark line on the back between the central and outer whitish lines. It feeds on cocksfoot and other grasses from August to April. The moth flies in June and July, and is not uncommon in meadows and grassy places, even by the roadside. Except that it does not, apparently, extend beyond Perthshire in Scotland, it seems to be widely, or even generally, distributed over the British Isles. Abroad it ranges to Siberia and Amurland.

Leucania l-album.—Barrett, " Lepidoptera of the British Islands," vol. ix. p. 450 (1904), remarks : " This species now seems to have made its way to this country, though it is still doubtful whether it has established itself. Mr. Eustace R. Bankes has captured a female specimen in South Devon, and he mentions the occurrence of one or two other specimens. It is a very pretty species, and widely distributed abroad." (See Appendix.)

The Devonshire Wainscot (*Leucania putrescens*).

So far as the British distribution of this species (Plate 147, Fig. 9) is known, it seems to be confined to the coasts of South Devon and South Wales. It was first noted at Torquay in the year 1859, and about twelve years later was detected in Carmarthenshire. Abroad it occurs somewhat locally in France, Italy, Dalmatia, and in North-west Africa.

The caterpillar is pale brown with three whitish lines on the back, the central one edged on each side with blackish, the others shaded above with blackish with black dots in the shading, and edged below by a blackish line; all these lines become faint on the last three rings of the body; the usual dots are black; head rather paler, somewhat shiny, the lobes conspicuously edged with black, and the jaws marked with blackish. It feeds on grasses from September to January. The figure on Plate 148, Fig. 7, is from one of a few caterpillars kindly sent by Mr. J. Walker, of Torquay. He writes: "They are full fed by the beginning of January as a rule, and although they go down, they do not turn until the beginning of June." Mine unfortunately died in the cocoon. The moth flies in July and August, and favours particular coves and banks by the sea. It visits sugar, and also the flowers of wild sage.

The White-speck or American Wainscot (*Leucania unipuncta*).

This moth (Plate 149, Fig. 4) is known in America, where it is exceedingly abundant and destructive, as the "Army Worm." It ranges through India, China, and Japan, and occurs in many other parts of the world, including Madeira and the Canary Isles. It is rare in Europe, and appears to have been noted in parts of Spain, Portugal, and France. Since Haworth described and

named it *unipuncta* in 1803 it has been renamed many times, and was long known in England as *extranea,* Guenée. About a score have been recorded as taken in England and Wales up to 1930, nearly all on the south or south-west coast, chiefly in September. Odd specimens have been recorded from Ireland since 1891, but in 1928 fifty-eight were captured at sugar and ivy blossom at Ummera from October to December. Odd ones have been taken since and also in Kent and Devon.

The Cosmopolitan (*Leucania loreyi*)

Barrett accepted this species as British, chiefly on the strength of two specimens captured at sugar by a sedgy ditch, nearer to Worthing than to Brighton in Sussex; the date was 1862. More recent records are one specimen at Torquay on September 27, 1900, and another, also in South Devon, September 6, 1903. The former taken at sugar, and the latter netted when "flying wildly over rough herbage at dusk." Ireland in 1910.

The species has a wide range through Southern and Eastern Asia, etc., but in Europe it is only found in the south and along the Mediterranean. The specimen shown on Plate 149, Fig. 6, is from India.

The Delicate (*Leucania vitellina*).

The first recorded British specimen of this species (Plate 149, Fig. 3) was captured at Brighton, Sussex, some fifty odd years ago. The species has occurred in and around that locality several times since, but seems to have been found more frequently at Torquay and other places on the Devonshire coast. It has also been recorded from the Scilly Isles, Cornwall, the Isle of Wight, the New Forest, and Chichester; Kent, on the coast, and inland at Canterbury. Sussex. In 1902, a year in which several specimens were obtained on the south coast

one example was taken at Navestock, in Essex. August and September are the months during which it is seen in this country, but abroad it occurs also in June and July. The caterpillar, which feeds on grasses in the spring, is described by Hofmann as pinkish ochreous with three white lines on the back and black dots between them, two on each ring ; below the black spiracles is a yellowish stripe ; head brown with black dots. It has occurred in some numbers since 1930.

The White-point (*Leucania albipuncta*).

This species (Plate 149, Fig. 5) appears to have been confused with the following one. It may be distinguished by its generally smaller size and the pure white spot on the fore wings. The colour of the fore wings is brownish red, rather than rusty tinged as in some reddish forms of *L. lithargyria ;* the second cross line is more distinct, and the series of black marks beyond less so. The hind wings are paler than those of the next species. The caterpillar is yellowish wainscot brown above, inclining to flesh-colour on the sides and beneath ; three white lines on the back, the central one edged on each side by a wavy blackish line, the outer ones edged above by a blackish line and below by a brownish line ; a pale stripe low down along the sides ; head ochreous, shining, and lined on the face with greyish. It feeds from autumn to spring on grasses. The moth is out from August to October. It occurs here only occasionally, and chiefly on the coast, in Kent (first taken at Folkestone, in 1868), Sussex, Hants, Isle of Wight, South Devon, and Essex (Shoeburyness). It was fairly common in Kent and Dorset in 1934.

The Clay (*Leucania lithargyria*).

Two specimens of this species are shown on Plate 150, Figs. 7 ♂, 8 ♀. The colour of the fore wings varies from pale ochreous brown, often with a pink tinge, to a deep rusty red ; the reniform

Pl. 152. *X* 312.

1. **Common Wainscot:** *caterpillar.*
2. **Shore Wainscot:** *caterpillar.*
3. **Clay Moth:** *caterpillar.*
4. **Brown Rustic:** *caterpillar.*
5, 5*a*. **Double Line:** *caterpillar and chrysalis.*
6. **The Anomalous Moth:** *caterpillar.*
7, 7*a*, 7*b*. **Small Mottled Willow:** *eggs, caterpillars and chrysalis.*

Pl. 153. *X* 313.

1, 3. **Reddish Buff Moth.**
4, 5. **Brown Rustic.**

2. **Marsh Moth.**
6. ***Xylophasia zollikoferi.***

stigma is generally represented by a pale crescent with a white or whitish dot at its lower end ; the cross lines are rarely distinct, but a series of black dots before the outer margin are usually well in evidence. The caterpillar is pale brown tinged with pinkish or yellowish ; central line white edged with dark brown, and on each side of this is an interrupted broad blackish line edged below with white ; a whitish line below the blackish spiracles ; head and plate on the first ring of the body, pale brown, rather shining, the former freckled with blackish. It is found in April and May on grasses, probably after hibernation, The moth is out from late June to early August and is common in woods, and woody places throughout the greater part of the British Isles.

The Brown-line Bright-eye (*Leucania conigera*).

This species (Plate 150, Figs. 1 ♂, 2 ♀) ranges in the colour of fore wings from pale ochreous brown to a dusky tawny hue ; the cross lines are sometimes very faint, but otherwise the markings are constant. Var. *suffusa*, Tutt, is described as rusty red suffused with darker scales, markings typical, but deeper in colour and more distinct. The caterpillar is ochreous or greyish brown ; three yellow lines on the back are black edged ; a yellow line along the sides is often edged with black, and the line below the black spiracles is blackish ; head pale brown marked with black. It feeds on grasses, and may be found in April and May. The moth appears in June and July and is pretty generally distributed. It is regarded as a common species in South England, but in the north seems to be rather local and most frequently found on the coast. In Scotland it does not appear to have been noted north of Ross or in the isles. It is common in Ireland. Abroad the range extends through Northern and Central Asia to India and Japan.

The Double Line (*Mythimna turca*).

The sexes of this species are shown on Plate 150, Figs. 3 ♂, 6 ♀. The general colour of the fore wings may be paler or darker than in the specimens shown. Sometimes the central area enclosed by the black cross lines is darker than the other parts of the fore wings; var. *obscura*, Tutt, has the fore wings obscure smoky grey, with a dull coppery tinge, much suffused with dark scales; markings indistinct.

The caterpillar is pale brown freckled with darker; a whitish line along the middle of the back is edged on both sides with blackish merging into black at the ring divisions; a rather wavy, but less distinct, whitish line on each side of the central one edged above with blackish; spiracles black ringed with pale brown and set in a broad dark brown line below which the colour is pinkish; head shining pale brown, freckled with darker on the cheeks. It feeds on cocksfoot and various other grasses occurring in woodlands. August to May. The moth, which inhabits woods and well-timbered parks, is out in June and July. It is, perhaps, most frequent in the New Forest, Hampshire, thence it is found more or less sparingly to Cornwall. Sometimes not uncommon in Savernake Forest, Wiltshire, and occurs in Berkshire, Buckinghamshire, Essex (Epping Forest, etc.), Surrey (Richmond Park). Recorded from Cheshire and from South Wales. In Scotland it is said to have been taken at Newfield, Ayrshire. The only records from Ireland are Clonbrock (1), and Merlin Park, Galway (2). Abroad it ranges to Amurland, China, Corea and Japan.

Treble Lines (*Meristis trigammica*).

The fore wings range in colour from whitish or greyish brown to ochreous brown; the cross lines are usually distinct,

and the central one is often broad. (Plate 151, Fig. 1.) In var. *approximans*, Haw., the cross lines fall nearer together on the inner margin ; and in var. *semi-fuscans*, Haw., the basal half is greyish or reddish grey, and the outer half is suffused with brownish (Fig. 2). Then there is a somewhat rarer form, with dark grey, brown, or blackish brown fore wings, with the cross lines more or less distinct, as in Fig. 3 ; or with the central one absent (var. *bilinea*, Hübn.) ; or all the lines may be obscured by the dark colour. Kane states that var. *obscura*, Tutt (= *bilinea*, Haw.), is pretty common at Howth and other places in Ireland, and, according to Barrett, it is not infrequent in Wales. The caterpillar is greyish or dingy reddish brown ; three pale lines on the back, the central one partly edged with black, and the outer ones are broken and inwardly edged with blackish marks ; the stripe along the black spiracles is ochreous brown ; head brownish. From July to April on plantain and other low plants. The moth is out in June and July. In Scotland it is local and rare, but has been recorded from Clydesdale, Arran, and once from Perthshire. Local but widely distributed in Ireland.

The Anomalous (*Stilbia anomala*).

A local species, but sometimes not uncommon on heaths, or in rocky places by the sea. It is found from Surrey westward to Cornwall ; and from Staffordshire, in which county it has been seen in abundance on Cannock Chase, it ranges into Derbyshire, Nottinghamshire, Cheshire, Wales (North and South), Lancashire, Yorkshire (commonly at Saltaire), Durham (once), and Cumberland. Generally distributed in Scotland, including the Orkneys. It occurs in the Isle of Man, and seems to be pretty widely spread in Ireland, but found chiefly on the coast. Abroad it seems to be only found in France and in Central and Western Germany. In Southern Spain it is

represented by var. *andalusiaca*, Staud., and in Syria by var. *syriaca*, Staud. A typical male is shown on Plate 151, Fig. 4.

The caterpillar is green, inclining to yellowish between the rings of the body ; three lines on the back are whitish, edged with dark green ; a stripe low down on the sides is whitish, shaded above with dark green merging into the ground colour ; head shining bright green, obscurely mottled with darker. In other forms the general colour is reddish or pinkish brown, with the lines edged and shaded with darker brown ; the head is ochreous brown, mottled with darker brown. The green form is figured on Plate 152, Fig. 6, but the browner forms are more frequent. It feeds on grasses from the autumn until about March.

The Mottled Rustic (*Caradrina morpheus*).

A specimen of this species is shown on Plate 151, Fig. 5. There is some variation in the darker mottling and suffusion of the ochreous or pale brown fore wings. The dark brown or blackish stigmata are generally distinct. Hind wings whitish, tinged with smoky on the veins, and in the female on the outer marginal area. The caterpillar is brownish or greyish brown, inclining to ochreous on the back ; central line whitish, with a broken edging of brown ; on each side of the central line there is a series of blackish arrow heads ; spiracles blackish ; head dark brown, and very glossy. It feeds from August and through the autumn on various low plants, including goose-foot, knot-grass, dandelion, etc. The moth flies from June to August, and occasionally there is a second flight in October. The species is generally distributed and often common over the greater part of England, but is less frequent in the more northern counties, and in Wales, Ireland, and Scotland. Abroad the range extends to Amurland and Corea.

Pl. 154. *X* 316.

1, 2, 3. **Copper Underwing Moth.**
4, 5. **Mouse Moth.**

Pl. 155

1, 2, 3. **Pine Beauty Moth.**
4. **White-marked Moth.**
5, 6. **Red Chestnut Moth.**
7, 8. **Hebrew Character Moth.**
9, 10. **Hebrew Character Moth,** *var. gothicina.*

X 317.

The Uncertain (*Caradrina alsines*).

This species (Plate 151, Fig. 6) and the next one—The Rustic—are often confused, but the present one may be recognized by the more ochreous tinge of its fore wings, the more distinct markings, and the general rougher appearance of all the wings. The hind wings are more smoky, or sometimes brownish tinged.

The caterpillar is ochreous brown, frequently with a reddish tinge ; three whitish lines on the back, edged with black, the edging of the central one interrupted at the ring divisions ; a dusky area along the sides is edged above and below by a black line ; head ochreous brown. It feeds from September to March on dock, chickweed, primrose, and various other low plants. The moth flies in July and August, and, like most of its congeners, is partial to the blossoms of privet. The species is widely distributed over England, but seems to occur more commonly in the south and east. It is also found in Wales, Scotland, and Ireland.

NOTE.—*C. superstes*, an inhabitant of Central and Southern Germany, Hungary, Southern Europe, and Asia Minor, has been mentioned as British, but the record needs confirmation.

The Rustic (*Caradrina blanda*).

Compared with the last species, the one now considered (Plate 151, Fig. 7) has browner fore wings, inclining to brownish or blackish, smoother and glossy ; and the markings are usually rather obscure. The hind wings are silky, and whiter in the male.

The caterpillar is greyish brown, with an olive tinge ; central line dark brown, expanding on each ring ; on either side of this is a brown-edged white line ; a light brown line along the spiracles ; head ochreous brown. It feeds from September to April on low plants, such as dock, chickweed, plantain, etc.

The moth flies from late June to early August, and its range in the British Isles is pretty much as in the last species, but more generally distributed than *alsines* in Ireland.

Vine's Rustic (*Caradrina ambigua*).

The fore wings of this species (Plate 151, Fig. 8) are rather greyer than those of the last, and the hind wings are shining white, tinged with greyish brown in the female, especially on the veins.

Barrett describes the caterpillar as follows: "Plump, cylindrical; head round, the lobes dark brown, but the face paler; dorsal region between the subdorsal lines broadly yellowish brown, with slender, delicate, oblique lines on each segment; dorsal line a row of black dots, one on each segment; lateral space from the subdorsal lines to the spiracles darker brown or umberous, containing a row of ovate, oblique, yellowish spots, each rather raised into a knob by the wrinkling of the skin; spiracles black; under surface, legs, and prolegs pale rosy brown, except the anal prolegs, which are brown." It feeds from October to May on dandelion, plantain, chickweed, and other low plants; also on lettuce and grass. The moth flies in August and September. Sometimes the caterpillars will feed up and attain the moth state the same year in November or December. The species was not known to occur in England until some specimens were taken by Mr. Vine at sugar, near Shoreham, Sussex, in 1879. Since that year it has been taken more or less freely at several places on the south and south-west coast, from Deal, in Kent, to Truro, in Cornwall.

The Pale Mottled Willow (*Caradrina clavipalpis*).

The black spots on the front margin of the fore wings of this species (Plate 151, Figs. 9, 10) are pretty constant characters,

and are usually present even when most or all the other markings are absent. The caterpillar is greyish brown, often tinged with green above; the lines are faintly paler, and edged with darker; head blackish. It feeds from September to May on grasses, seeds of plantain; also on peas and corn; often common in stacks of wheat and other grain.

The moth flies chiefly in July and August, but it is sometimes seen as early as May and as late as October. Generally distributed, and often very common. Except that it does not occur in America the range abroad is almost as extensive as that of the next species.

Small Mottled Willow (*Laphygma exigua*).

This species (Plate 151, Fig. 11) practically ranges over the globe. It is the "Beet Army-worm" of American economic entomologists; whilst in South Africa it is known in the early stage as "The Pigweed Caterpillar." In Asia, and especially in India, where it is destructive to the indigo plants, maize, etc., it is a familiar pest, but does not seem to bear a common name. As regards our own country, it was apparently unnoticed until somewhere about the middle of the last century, when a specimen was captured in the Isle of Wight. Its occurrence here is always considered a noteworthy event, but the records are very scanty except for the years 1896, 1897, 1900–03, and 1906. In the latter year there seems to have been an invasion on quite a large scale, and captures in some localities on the south and south-west coasts must have been in hundreds, whilst the species was also taken in fewer numbers in Essex, Surrey, Wiltshire, Somerset, Devon, and South Wales. A specimen occurred at Crosby, Lancs., in 1884. In 1903 one example was taken at Chester, Cheshire. At Keighley, Yorks, eight were secured, which, added to three taken in other years, gives a total of eleven specimens for the county. In Ireland one example was

obtained at honeydew, September, 1899, at Timoleague, Co. Cork. It appeared in some numbers in Southern England in 1937.

The eggs (Plate 152, Fig. 7*a*) are laid in batches on a leaf, and more or less covered with whitish hairs. Some deposited on Sept. 8, 1906, hatched on the 20th of that month. When just hatched the caterpillar is greenish, paler on the last rings ; head and plate on first ring shining black ; when a week old a black plate appears on the last ring also. Later on the colour varies from green to olive green, brownish, and dark greyish. Green examples are figured on Plate 152, Fig. 7. The central line is ochreous, and there are series of black bars and blackish marks on the back ; along the black-edged white spiracles is a pinkish brown band, edged above by an interrupted black line ; the pinkish brown colour runs up the front part of each ring four to eleven ; head blackish. The caterpillars were fed upon plantain, dandelion, and groundsel, but they would eat the foliage of any weed that was put in their cage. They formed fairly tough earthen cocoons on, or just below, the surface ; but, although they pupated, the moths failed to emerge, probably because they were kept too dry. The ochreous or pinkish brown colour of the orbicular stigma, and sometimes of the reniform, distinguishes this moth ; the hind wings are white with a very distinct pearly gloss.

The Small Dotted Buff (*Petilampa minima*).

This pale whity-brown insect (Plate 134, Figs. 19 to 21) is often without markings, and where these are present on the fore wings they comprise two series of dusky dots representing two cross lines, and sometimes there is a dot at the end of the cell. These wings may be shaded with brown, and occasionally there is a dark band-like shade between the series of dots, in the male as well as in the smaller and narrower-winged female.

The caterpillar, which may be found in May and June in the flower stems of *Aira cæspitosa*, is of a pale pinkish ochreous with three darker bars on each ring, and a brown, glossy head. The moth flies in July and part of August, and may be found, often in abundance, in most English and Welsh counties, in Scotland to Aberdeenshire ; and widely spread in Ireland.

The Reddish Buff (*Acosmetia caliginosa*).

Both sexes of this reddish tinged grey-brown species are shown on Plate 153, Figs. 1 ♂, 3 ♀. As will be noted, the female is much smaller than the male. Except that it has been recorded from the Isle of Wight and from Bloxworth, Dorset, in the past, this species is restricted to certain portions of the New Forest, Hampshire. Even in these favoured haunts its numbers have become far less than formerly. The moth is out in July. Apparently it has no taste for sugar, neither does it seem to visit blossoms of any kind. It may be disturbed from its retreat among the grass by day, or netted as it flies at dusk. The caterpillar is stated by Hofmann to live on saw-wort (*Serratula tinctoria*) ; it is sap-green, yellow at the ring divisions, and marked with fine white lines.

The Marsh Moth (*Hydrillula palustris*).

The fore wings of the male of this species (Plate 153, Fig. 2) are greyish brown in colour, and more or less tinged with violet ; the cross lines are dusky, and the reniform and orbicular stigmata are represented by black dots, the former the larger ; hind wings whitish with a smoky tinge. The female is much smaller, darker, and the cross lines heavier ; hind wings blackish grey.

Stainton (" Manual," 1857) refers to a specimen taken at Compton's Wood, near York, and this, no doubt, is the same as

that stated by Barrett to have been captured in a moist place at Stockton-in-the-Forest, about four miles from York, certainly before the year 1855. Then there is a record of a specimen from Quy Fen, Cambridgeshire, in May, 1862. Seven years later the late Mr. C. G. Barrett took a specimen as it fluttered about a gas-lamp outside Norwich. In 1877 and 1878 the use of bright collecting lanterns in Wicken Fen may have led to the capture of nearly twenty Marsh Moths, anyway it seems to have been a record for the time.

Very few specimens were taken in the fens between the year last mentioned and 1898, when the total secured by several collectors visiting the fens in June of that year amounted to something like fifty examples, all males. Two female specimens were captured in the Carlisle district, one in 1896, and the other in 1897. No male was noted in that locality until 1899, when a specimen was netted as it flew along a hedgeside at night, on May 20. Two other males have since been taken there, in much the same way. The life history of the species is little known. The caterpillar is very like that of *C. morpheus*, but is blackish grey and the head is black. It is more velvety in appearance and not so shiny. It feeds on low plants from July to October and then hibernates. It does not feed again before it pupates about April.

The range of the species abroad extends to Siberia and Amurland.

The Brown Rustic (*Rusina umbratica*).

Here, again, the female is smaller than the male, as will be seen on Plate 153, Figs. 4 ♂, 5 ♀. Sometimes the general colour of the fore wings is of a blacker tint, and in such specimens the fine black cross lines are obscured.

The caterpillar is dark cinnamon brown; three whitish lines on the back, the central one most distinct on the front

Pl. 156. *Y* 322.

1, 1*a*, 1*b*. **Hebrew Character:** *eggs, caterpillars and chrysalis.*
2, 2*a*. **Clouded Drab:** *caterpillars and chrysalis.*
3. **Mouse Moth:** *caterpillar.*

Pl. 157. Y 323.

1–6. **Clouded Drab Moth.**
7, 8. **Lead-coloured Drab Moth.**
9, 10. **Northern Drab.**

rings, is edged on each side with dark brown, and the shading of the outer lines is interrupted by oblique pale dashes; head, shining dark brown, almost blackish. It feeds on grasses, and many low-growing plants from August to May. (Plate 152, Fig. 4.) The moth flies in June and July, sometimes earlier. The species is generally distributed over nearly the whole of England, but more local in the north than in the south. It is found in North and South Wales. In Scotland it is locally abundant and widely distributed up to Ross, and occurs in the Hebrides. It is also widely spread in Ireland, and common in some parts.

The Copper Underwing (*Amphipyra pyramidea*).

The striking species shown on Plate 154, Figs. 1 to 3, varies somewhat in the tint of its brown-coloured fore wings, and in the greater or lesser amount of blackish shading on the central area; the latter is sometimes quite absent, and not infrequently the outer marginal area is pale ochreous brown. The hind wings, normally of a coppery colour, are occasionally paler, and sometimes of a reddish hue.

The caterpillar is green with three interrupted whitish stripes on the back; the dots are yellowish; and the stripe along the black-edged white spiracles is whitish; the back of ring eleven is raised, forming a cone, the apex of which is hornlike and slightly curved backwards; the head is green. It feeds from April, or in forward seasons from March, to June, on the foliage of oak, birch, sallow, plum, rose, and other trees and shrubs. The moth flies from late July to September, and sometimes later. Although somewhat local in Southern England, it is often common enough in the New Forest, and most of the larger woods from Essex to Devonshire. Northwards from Oxfordshire it becomes more local, less frequent, and even rare,

except, perhaps, in Worcestershire (Malvern district, common) and Herefordshire. Apparently not recorded from Scotland. In Ireland it is sometimes plentiful in the south but does not seem to be quite so frequent in the north.

The Mouse (*Amphipyra tragopoginis*).

The English name of this generally distributed, and usually common, greyish-brown moth (Plate 154, Figs. 4, 5) applies more especially to the mouse-like way it scuttles off when discovered in its retreat by the collector. In colour, however, it is sometimes not unlike the familiar little rodent. The caterpillar (Plate 156, Fig. 3) is green with white lines and stripes along the back and sides; spiracles white, margined with black; head yellowish-green. In another form the ground colour is pale reddish brown. It feeds from April to June on sallow, hawthorn, and many other plants. Barrett states that it is partial to the blossoms, particularly yellow ones, of garden as well as wild plants. The moth flies in July and August, sometimes later. Common throughout Ireland.

The range abroad extends to Central Asia and to the Atlantic States of America.

The Pine Beauty (*Panolis flammea*).

The general colour of the fore wings of this species (Plate 155, Figs. 1, 3♂, 2♀) is ochreous brown, more or less reddish tinged; sometimes greenish grey. The cross markings are bright or dull reddish brown; the orbicular and reniform stigmata are white, or outlined in white, sometimes connected by a white line along the median nervure; occasionally these marks are united, forming a blotch.

The caterpillar is green with three broad white lines along the back, the outer ones edged above with black; a yellow, inclining to reddish orange, stripe along the black spiracles; head reddish brown. It greatly resembles the needles of the Scotch fir (*Pinus sylvestris*), upon which it feeds from May to July. The moth is out in the spring and continues on the wing until early May, and is often common at sallow bloom, where this occurs in the immediate vicinity of pine woods; it also comes to the sugar patch not infrequently, and may occasionally be seen on the trunks of fir trees, or beaten from the boughs. The species seems to occur wherever there are fir woods or plantations throughout England, Wales, and Scotland to Ross, and is found locally in Ireland.

The White-Marked (*Gypsitea leucographa*).

A portrait of this moth will be found on Plate 155, Fig. 4. The fore wings are reddish brown, sometimes tinged with purplish, or clouded with blackish. The reniform and orbicular stigmata are usually yellowish grey, often only outlined, but not infrequently indistinct, and sometimes absent. The cross lines are rarely well defined, although the second line may be indicated by blackish dots flanked by whitish ones on the veins.

The caterpillar is green freckled with whitish; three whitish lines along the back are edged with dark green, the outer ones with oblique dark-green dashes spreading to the central line; head paler green. In another form the general colour is pale reddish brown, lines yellowish, and dashes darker reddish brown. It feeds on sallow, bilberry, dock, plantain, and other low plants. May and June. The moth flies in March and April, and may be found at sallow bloom around woods. The species is obtained more or less frequently in Kent, Surrey, Sussex, Hampshire, Somerset, and Devon; also in Buckinghamshire and in Suffolk. In Herefordshire it is local but not

uncommon, and I have taken it in the Malvern district. British specimens were first obtained near York. Porritt ("List of Yorks. Lep.," 1904) states that it is still abundant in Bishop's Wood, and is found in other Yorkshire localities; also occurs from Lancashire to Durham. In Ireland it has been reported from Clonbrock, Galway.

The Red Chestnut (*Cerastis rubricosa*).

The fore wings of this moth (Plate 155, Figs. 5, 6) are purplish red and more or less suffused with greyish. Sometimes these wings are more distinctly reddish and without the greyish suffusion (var. *rufa*, Haw.). The egg is pale straw colour, with a reddish-brown girdled dot. The caterpillar (Plate 159, Fig. 3) is pinkish brown with three yellowish lines along the back, the central one rather obscure; a yellowish stripe along the sides; usual dots yellowish or whitish margined with blackish; head yellowish brown, lined with darker brown. It feeds from April to June on dock, dandelion, groundsel, and other low plants. The moth is out in March and April, and is often not uncommon at sallow and plum blossom. It seems to be pretty generally distributed throughout the British Isles, including the Orkneys.

The Hebrew Character (*Orthosia gothica*).

This species (Plate 155) varies in the general colour of the fore wings from pale purplish grey to dark reddish brown. Figs. 7 ♂ and 8 ♀ represent the more usual form. The black markings, often very conspicuous, are in the somewhat smaller var. *gothicina*, reddish (Fig. 9). Sometimes in Scotch specimens they are very indistinct or absent (Fig. 10).

The early stages are figured on Plate 156. The eggs (Fig. 1*a*) are laid in a batch, two deep towards the centre of the

heap. In colour they are whitish with a dark grey ring and dot. When five days old the young caterpillars were pale whitish green with black dots ; head and plates on first and last rings of the body black. The nearly full-grown caterpillar (Fig. 1) is green above and yellowish green below ; three whitish lines on the back and a yellowish stripe along the sides ; usual dots black, ringed with whitish ; head shining yellowish, dotted with black. Feeding on dock, dandelion, etc., it will also eat sallow and hawthorn, and the foliage of other trees and bushes, in April, May, and June. The moth is common at sallow bloom all over the British Isles. The range of the species abroad extends to Amurland.

The Blossom Underwing (*Orthosia miniosa*).

A portrait of this species will be found on Plate 158, Fig. 8. The fore wings are pinkish, or reddish grey, and the redder central area is often tinged with orange ; the hind wings are whitish, faintly shaded or tinged with pink.

The full-grown caterpillar is bluish, inclining to black on the sides ; three yellow lines on the back, the central one broad ; and a white blotched yellow stripe along the sides ; head shining black. (Adapted from Fenn.) The eggs are laid in batches on the twigs of oak, usually just below a bud. When the caterpillars hatch out they spin a web of silk under which they live in company for a time ; later on they separate, and then either continue to feed on the oak or betake themselves to birch, hawthorn, bramble, or some low-growing herbaceous plant. The "nests" of young caterpillars are found chiefly on oak bushes rather than trees.

The moth flies in March and April, and generally occurs only in oak woods. It is most frequently met with in the South of England—from Middlesex and Essex to Hampshire ; but it occurs in most of the southern counties, and also northwards

up to Yorkshire. It has been found in Wales (Pembroke and Dolgelly), and appears to be rare in Ireland, except at Glenmalure, Co. Wicklow.

The Small Quaker (*Orthosia cruda*).

Most specimens of this species (Plate 158, Figs. 9♂, 10♀) have the fore wings pale greyish ochreous, more or less mottled or dusted with reddish brown. Occasionally these wings are pale grey (var. *nana*, Haworth); or dark grey brown and more rarely blackish. The dingy brownish dots representing the first and second cross lines are sometimes distinct and not infrequently absent.

The egg is whitish with brown girdled dot.

The caterpillar is greenish grey and rather greener between the rings; there are five yellow or whitish lines, that along the centre of the back being the broadest, usual dots black and glossy; head greenish, much marked with black: plates on first and last rings of the body black. It feeds from April to June on oak, hawthorn, sallow, rose, etc. (Plate 159, Fig. 2.) The moth flies in March and April, and is a constant visitor to the sallow catkins, also to the blossoms of plum, damson, and sloe. It appears to be common throughout England and Wales; more or less frequent in Scotland to Moray; and is not uncommon in some parts of Ireland.

The Common Quaker (*Orthosia stabilis*).

The ground colour of the fore wings of this species (Plate 158, Figs. 1, 2) ranges from whitish or pale grey brown through tints of reddish brown to dark brown; the stigmata are outlined in pale ochreous, the centres often darker than the general colour of the wings; the orbicular is of large size and frequently

touches the reniform ; the ochreous submarginal line is usually inwardly edged with, and sometimes obscured by, blackish ; very often the submarginal line and the dusky central shade are the only distinct cross markings.

The caterpillar is green, minutely dotted with yellow ; three lines on the back, and a stripe on the sides, yellow, the latter most distinct, edged above with black, and united by a yellow bar on the last ring. It feeds on oak, birch, sallow, beech, elm, etc., from April to June. The moth flies in March and April, and is generally common throughout the British Isles, except, perhaps, the islands of Scotland.

The Lead-coloured Drab (*Orthosia populeti*).

The ground colour of the species shown on Plate 157, Figs. 7, 8, is usually some shade of purplish grey, ranging from very pale to dark ; the cross lines are often indistinct, but occasionally they show up clearly ; the central shade, usually in evidence, is sometimes almost blackish and broadened out to the second line ; the orbicular and reniform have pale margins but the centres are frequently no darker than the general colour.

The egg is greyish white with dark grey girdled dot.

When full grown the caterpillar is whitish or yellowish green, but always whitish on the back : three white lines on the back, the central one rather broad ; head ochreous brown with a blackish spot on each side. It feeds from April to June on aspen chiefly, but also on other kinds of poplar, hiding by day between two leaves. The moth is out in March and April, and may be found on the sallow catkins. It seems to be more or less rare in the South of England, but it is locally not uncommon in many parts of the country from Middlesex northwards to Yorkshire. Farther north it is again infrequent, and this is also the case in Scotland and in Ireland.

The Clouded Drab (*Orthosia incerta*).

Six specimens of this most variable species are shown on Plate 157, Figs. 1 to 6. To refer in detail to all the forms, named or otherwise, would occupy much space, so that it can only be stated here that the general colour of the fore wings ranges from pale greyish brown, through various shades of reddish brown, to deep brown or purplish brown ; the darker greys range through slaty grey to purplish black. In all the lighter shades the wings are usually much variegated, but they may be nearly or quite plain.

The egg is yellowish white with brown girdled dot

The caterpillar is green, minutely freckled with whitish ; three white lines on the back, the central one broadest ; a white stripe, edged above with black, along the sides ; usual dots black, minute, ringed with whitish ; head yellowish green with a few black dots. It feeds on sallow, oak, hawthorn, also on apple, elm, etc. (Plate 156, Fig. 2.) The moth is generally to be found at sallow-bloom in almost every part of the British Isles.

The Twin-spotted Quaker (*Orthosia munda*).

The fore wings range in ground colour from very pale ochreous (typical) or pale greyish (var. *pallida*, Tutt), through reddish shades to a dingy brown. The black or brownish twin spots on the middle of the submarginal line are sometimes accompanied by others above and below them (var. *geminatus*). In var. *immaculata*, Staud., the "twin spots," and also the others, are absent. (Plate 158, Figs. 11, 12.)

The caterpillar (Plate 159, Fig. 1) is pale brown minutely freckled with darker ; a whitish line along the centre of the back finely edged with black ; a broad velvety black stripe along the sides, edged with whitish ; head reddish brown.

Pl. 158. *Y* 330.

1, 2. **Common Quaker Moth.** 3–7. **Powdered Quaker.**
8. **Blossom Underwing.** 9, 10. **Small Quaker.**
11, 12. **Twin-spotted Quaker.**

Pl. 159.

V 331.

1. **Twin-spotted Quaker:** *caterpillar.*
2. **Small Quaker:** *caterpillar.*
3, 3a. **Red Chestnut:** *caterpillar and chrysalis.*

freckled with darker. It feeds from April to June on elm, oak, sallow, plum, etc. The moth is out in March and April, but a specimen has been taken at "ivy bloom" in the autumn. Plum blossoms, as well as the sallow catkins, are an attraction to this moth, and it will also visit the sugar patch. The species probably occurs in most woodland districts throughout the greater part of England and Wales. It seems to be found in South Scotland, but is local and infrequent; in Ireland it is widely spread in the north and east, but uncommon in the south.

The Northern Drab (*Orthosia opima*).

The dark form (var. *brunnea*, Tutt) (Plate 157, Fig. 10 ♂) has the outlines of the orbicular and reniform stigmata, and the submarginal line pale and distinct; sometimes the general colour is much blacker than in the specimen shown. In the more typical greyish form (Fig. 9 ♀) the central area is blackish or dark reddish brown. The caterpillar is olive green above, inclining to yellowish beneath; three pale lines on the back, and a yellow stripe along the black-edged white spiracles; head olive green. It feeds from April to June on sallow, willow, birch, rose, etc. The moth flies in March and April.

As suggested by the English name, this moth was supposed to be confined to the northern counties from Cheshire to Cumberland and Northumberland, but it occurs more locally in Herefordshire, Worcestershire (Wyre Forest), Somerset, Gloucester, and Wales; also in Essex, Surrey, and Sussex. Renton records it from Roxburghshire in Scotland, and Kane states that it is local in Ireland.

The Powdered Quaker (*Orthosia gracilis*).

In the ordinary English form of this species (Plate 158, Figs. 3 ♂, 4 ♀) the fore wings are pale whity brown, more or

less tinged with grey; the submarginal line, and the stigmata, are usually distinct, but the other cross lines are only indicated by blackish dots on the veins. In Ireland the specimens are creamy white and very often tinged with pink (Fig. 5), but in the New Forest, Hants (Fig. 7), and in the marshes of North Kent (Fig. 6), deep purplish grey, purplish brown, and reddish (var. *rufescens*, Cockerel) forms occur.

The caterpillar is green, sometimes tinged with yellowish or with bluish; usual spots whitish; three whitish or yellowish lines along the back and one along the sides, the latter shaded above with dark green or blackish; head ochreous brown. It feeds from May to July on meadow-sweet (*Spiræa*), fleabane (*Inula*), purple loosestrife (*Lythrum salicaria*), yellow loosestrife (*Lysimachia vulgaris*), sweet-gale, sallow, bramble, etc. The moth is out in April and May, and is often plentiful at damson and plum blossom, as well as sallow catkins. The species is widely distributed throughout the greater part of the British Isles, but is perhaps more generally common in the southern and eastern counties of England. The range abroad extends to Japan.

APPENDIX.

Page 41. **Celerio livornica.**—Further records are: In July 1909, a dead male specimen was found under an electric light standard at Exeter, and one was noted on a bowling green at Blackpool in October. Specimens were recorded from Surrey, Sussex, Hants, Devon, and Cornwall in 1911. On January 19, 1912, a male was taken from a shrub in a garden at Tavistock. Thirty-five were captured in South Cornwall between May 9 and 23 of the same year, and single specimens were reported from North Wales, Norfolk, Dorset, also in May. Larvæ were found in S.E. Kent in July, 1931, on galium.

Page 47. **Daphnis nerii.**—Further records: Ilfracombe, September 22, 1909; Sydenham, September 24, 1910; Eastbourne (August 15), Ashford, 1911; Folkestone, August 30, 1916, on trunk of poplar tree; Littleover, Derbyshire, in a conservatory, August 18, 1917; Dovercourt, Essex, September, 1919.

Page 141. **Celama cristatula.**—A grey form of this species, ab. *columbina*, Image, has been recorded from Epping Forest.

Page 146. **Sarrothripus revayana.**—A number of forms of this species are named and described by Mr. Sheldon in the *Entomologist* for 1919.

Page 169. **Utetheisa pulchella.**—Also reported from Dublin, Cork, Kerry, and Waterford.

Page 195. **Apatele tridens** has a smooth, oily appearance, whereas in *A. psi* the scales look rougher and more hoary.

Page 208. **Euxoa obelisca.**—It is not definitely known whether the eggs hatch in the autumn and the young larvæ hibernate or do not hatch until the following spring.

Page 223. **Amathes triangulum.**—The caterpillar is brownish or ochreous, blackish speckled, head pale brown with two blackish streaks. There is on each side of the dorsal line a series of oblique oblong markings beginning on the 5th segment and extending to the twelfth, where they are more or less united and followed by a pale bar. Subspiracular line pale ochreous. Feeds on birch, hawthorn, blackthorn, bramble, sallow, dock, etc. August to May.

Page 241. **Diataraxia oleracea** *ab.* **essoni,** Hamps.—On July 12, 1909, Mr. Esson, of Aberdeen, captured a specimen of a noctuid moth at sugar on a fir tree. This he sent to me for identification. As the insect was a novelty to me, it was submitted to Sir George F. Hampson, who, thinking that the moth was not only a species new to science, but not even congeneric with any other noctuid, described and figured it as *Peucephila essoni,* Hamps., *vide* Trans. R. Ent. Soc. Lond. 1909, Part IV, Pp. 461–463, Pl. xvi, Fig. 1, Entom. 1909, p. 258.

This insect has definitely been determined by Mr. Tams to be only a striking aberration of *Diataraxia oleracea.*

Page 259. **Xylomyges conspicillaris.**—Dr. A. E. Cockayne in Ent. Rec. XLIX, 81, 82, has shown that the *ab. intermedia,* Tutt, is the female of the plain grey type. In *ab. melaleuca,* View., the females are more black and white than the males. Plate 128 illustrates *melaleuca.*

Page 268. **Luperina guenéei.**—Over thirty years ago the late Mr. Baxter, of St. Anne's, Lancashire, sent me a specimen of *Luperina* that he had captured in his district. This I con-

sidered to be a form connecting *guenéei* with *nickerlii*, and that both were forms of *L. testacea*. Since that time *guenéei* has been found in some numbers on the Lancs. coast. It is now known to be a form of *L. nickerlii* and not of *L. testacea*.

The earlier published history of this species in Britain may here be quoted: "The late Mr. J. B. Hodgkinson, in a note on *Luperina guenéei*, published in the *Entomologist* for 1885, Vol. 54, wrote:—'In 1860 or 1861, T. Porter (still living) brought me two fine specimens of a moth I did not know. They were of both sexes. I purchased them from him, and sent them on to the Rev. H. Burney, who forwarded them to Henry Doubleday. From him they went to Guenée, and he returned them with the remark that he had a specimen in his collection marked as a variety of *L. testacea*, but he was quite satisfied they represented a good species when he saw both sexes. H. Doubleday then named them after Guenée, as the latter was evidently the original captor. I saw Porter again, and he told me another man, by name H. Stephenson, had one. They took three in all near the ferry at Rhyl, North Wales. I sent Porter again, and went myself, but we failed to find more afterwards. I bought the specimen from Stephenson, and sent it to Miss Sulivan, of Fulham, where, I suppose, it remains. I think it was a female.'"

According to Barrett (*British Lepidoptera*, IV., p. 335), the three North Wales specimens "were raked from overhanging edges of sandhills."

Page 275. **Procus latruncula** (The Tawny Marbled Minor) has been found to be a distinct species from *P. strigilis*. On the whole *P. latruncula* is slightly smaller than *P. strigilis*, the colour is more uniform and there is not so much white in the subterminal area. Both produce dark forms, but the dark *latruncula* are of a reddish bronze-green shade, whereas the dark *strigilis* are of a blackish tint.

In the absence of Haworth's type of *æthiops*, it cannot be definitely ascertained to which species it belonged, but it would be as well if the name *æthiops* was retained for the black form of *strigilis*. The dark form of *latruncula* will therefore require a name, for which we propose *ab.* **æruginis (ab. nov.).**

Page 275. **Procus versicolor,** Bork. Harrison recorded three specimens from Inverarish Raasay. (Proc. Univ. Durham, Philosoph. Soc. ix., Pl. V., p. 314.)

Page 279. **Apamea zollikoferi.**—Five specimens were taken in S.E. Kent in September, 1934, and one in N. Devon.

Page 294. **Hydræcia crinanensis.**

> " *Hydræcia crinanensis*, Burrows. Larger than *H. nictitans*. F.-w. slightly pointed at the apex, bright red-brown, longitudinal and transverse lines very distinct, fringes concolorous. Orbicular stigma, lighter than the ground colour. Reniform stigma orange, full, fairly straight edged inwardly, lower lobe projecting outwardly, interior lines faint. H.-w. red-brown, darker towards the outer margin ; fringes yellow, the yellow colour intruding in dots upon the darker margin."
>
> " Type specimen taken by Mr. A. W. Bacot at Crinan Canal, September, 1899."

The above is extracted from an instructive paper by the Rev. C. R. N. Burrows, entitled, " On the *nictitans* group of the genus *Hydræcia*, Gn.," published in the *Transactions of the Entomological Society*, 1911, pp. 738–749, plates li.–lviii. In this paper specific rank is also claimed for *lucens*, Freyer., and *paludis*, Tutt, both of which have been considered merely as forms of *H. oculea*, L.

H. lucens, Freyer., is certainly a distinct species.

H. crinanensis has been recorded from Inveran, Crinan Canal, Aberfeldy, and Liddelbank, in Scotland ; from Lough Foyle and Enniskillen, in Ireland ; and from Bolton and Burnley, in England.

Page 298. **Nonagria neurica.**—In 1907, when the first edition of this volume was published, the fact of *N. neurica* being a British species was not truly ascertained. In the following year, however, some specimens of *Nonagria*, which were not identical with *N. dissoluta*, Treit.=*arundineta*, Schmidt, were named *edelsteni*, Tutt.

Quite a number of *N. edelsteni* were obtained by Messrs. Wightman and Sharp in the Cuckmere Valley of Sussex, July, 1908.

At a meeting of the Entomological Society of London, held on November 4, 1908, a series of bred *edelsteni* from Sussex was exhibited by Mr. Edelsten.

By a consensus of opinion among entomologists, Sussex specimens are now considered to be true British representatives of *neurica*, Hübn., Fig. 381.

Page 299. **Chilodes maritima.**—Dr. Cockayne has found that the larvæ also feed upon the white inner lining of old reed stems.

Page 301. **Arenostola extrema** and **A. fluxa.**—The life history of these species was published in *The Entomologist* for Oct., 1912.

Page 309. **Leucania l-album.**—Between 1901 when E. R. Bankes took the first specimen in S. Devon, and 1933, the British captures might have been counted on the fingers of one hand. In Sept., 1933, G. W. Wynn took the insect at sugar in the same locality as Bankes. Since then it has been captured in considerable numbers on the S. Coast. It was especially abundant in 1936 and 1937. It has two broods, appearing in July and again in September. The larva is rather similar to that of *L. albipuncta*, but Dr. Cockayne, who gives a detailed life history of the species in *Ent. Record*, Vol. 50, No. 2, Feb., 1938, says that it is more slender than the larva of *albipuncta*. The head is yellower and smaller and the colour redder in tone. It feeds on grasses, and probably is attached to *Festuca arundinacea*.

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